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ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1856.

REPORT

OF THE

Trustees of Water Works

TO THE

CITY COUNCIL

OF THE

CITY OF CLEVELAND

Published by Order of Council.

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173702

REPORT

OF THE

TRUSTEES OF WATER WORKS.

To the Hon. Mayor and City Council of the City of Cleveland:

In compliance with law we herewith submit our Annual Report, showing the condition of the Water Works at the close of the year 1856.

With the exception of laying down the inlet pipe in the lake, and the waste pipe at the reservoir, the works were substantially completed during the year, and the cost but little exceeds the estimates of our last report.

For a detailed description of the character, capacity and cost of every branch of the works, we refer with pleasure to the accompanying report of the engineer, T. R. Scowden, Esq., to whose experience, taste and skill, the city is mainly indebted for the admitted excellence and superiority of its Water Works.

The supplemental report of the resident engineer, Mr. Singer, exhibits the actual condition of the works with estimates of expenditure necessary for their completion and protection, and appended to his report will be found carefully prepared schedules, as follows:

Schedule "A"	showing the diameter and length of the pipe laid, and the streets where laid. Total length, 13 miles and 54 feet.
Schedule "B"	shows the number, size and location of the 130 stop-valves.
Schedule "C"	the number and location of the 44 fire hydrants.
Schedule "D"	is an inventory of the tools, coal, oil, etc., at engine house.
Schedule "E"	is an inventory of tools, stock and patterns at the workshop.
Schedule "F"	is an inventory of tools of pipelayers and street men.
Schedule "G"	is an inventory of pipes and attachments on hand.
Schedule "H"	is an inventory of office furniture, stationery, etc.

The accompanying abstract from the Secretary's books, marked "I," presents the financial condition of the Board.

The amount of the loans authorized by law, and the vote of the electors was $500,000. The negotiation of which was er ed to our late colleague, Mr. Hilliard, under whose prud sagacious management the bonds were disposed of at a l premium.

The entire avails of the bonds, after deducting commissions and expenses were		$523,038 63
Construction account audited and paid to Dec. 31	$507,150 80	
Bills payable and balances ascertained but unpaid	6,446 71	513,597 51
Leaving balance		$9,441 12
Outstanding bills chargeable to this account	$1,304 48	
Estimated cost of laying down inlet pipe	8,000 00	
Estimated cost of laying down waste pipe	1,000 00	10,304 48
Leaving estimated deficit of		$863 36
Add various items estimated in Mr. Singer's report, say...		2,811 00
Making total of		$3,674 36

Which needs to be provided in order that the work may be done at the favorable season of the year.

To loan money for this purpose, and also to provide for extending water pipes in a few streets where they are not yet laid, it will be necessary to procure farther legislation. Until quite recently it was supposed that the 6th section of the General Municipal Act of 1852 empowered the City Council on the petition of the trustees to borrow for these purposes any sum not exceeding $75,000; but the better opinion now is, that the benefits of that section are restricted to cities, whose works were in operation at the date of the act.

The expediency of extending the water pipes to other streets has already become manifest. In three instances so urgent and meritorious were the applications, we have been induced to aid indirectly in accomplishing what we should have greatly preferred to do directly. The parties have advanced the cost of the pipe, and laying it down, and we allow them a deduction from their annual rent equivalent to 7 per cent on the cost, reserving the right at any time to assume the pipe for the city on payment of the principal cost. In these cases the rent, after deducting for interest, is 45 per cent on the entire cost. Other applications for the extension of pipe are pressed upon our attention, and we deem it the true interest and policy of the city to lay down pipe, which costs but a dollar per foot, wherever the rental will produce 25 or 30 per cent on the outlay. A considerable sum could be thus advantageously invested during the next spring.

The accompanying statement of the secretary, marked "J," shows the amount of rents received for the quarter ending December 31st.

The expenses of operating the works for the ensuing year, including coal, salaries, etc., and necessary repairs, we estimate at $15,000, and it is expected the water rents for the same period will be sufficient to meet this charge.

For the ensuing year at least the interest on the water loan will have to be raised by a tax, which tax, under the 14th section of the act of April 1st, 1856, must be levied by the Council, "upon all the taxable property adjoining, abutting to or bounded upon any street, lane, alley, public ground, square, block or premises through which water pipe has been laid."

After the first year it is confidently believed that this burthen will be materially lessened by the rents, and that at an early day it will cease to be a charge on the taxable property of the city.

It should be borne in mind that the interest on the water loan is payable in New York, semi-annually, on the 1st days of July and January, while the tax levied to meet it, is not collected and paid over till the following March. It will therefore be necessary for the Council to provide, by temporary loan or otherwise, for the prompt payment of the interest as it falls due.

We also submit herewith a copy of the by-laws and regulations adopted by the Board, for the management and protection of the works, and to which the law gives the same validity as to the ordinances of the City Council.

We also annex a copy of the "Tariff" of water rents which was adopted by the Board after a careful comparison with the rates established in other cities, and with a view of making it as moderate as possible.

All of which is respectfully submitted.

H. B. PAYNE,
CHAS. L. RHODES,
D. H. BEARDSLEY,
Trustees.

Cleveland, March, 1857.

ENGINEER'S REPORT

UPON THE

Character, Capacity and Cost of Cleveland Water Works.

To the Trustees of Water Works:

Gentlemen:—The water for the supply of the city is obtained from Lake Erie, 300 feet west of Old River Bed, by laying an inlet pipe made of boiler plate 3-8 inch thick, 50 inches diameter and 300 feet long, extending from the shore to the source of supply at 12 feet depth of water.

The inlet pipe terminates in the lake at a circular tower, constructed of piles driven down as deep as they can be forced into the bottom of the lake, forming two concentric rows of piles, two abreast, leaving 8 feet space between the outer and interior rows, which space is filled with broken stones to the top of the piles. The piles are then capped with strong timber plates, securely bolted together and fastened with iron to the piles.

The outside diameter of the tower is 34 feet, the inside diameter is 8 feet, forming a strong protection around an iron well-chamber which is 8 feet diameter and 15 feet deep, which is riveted to the end of the inlet pipe. An iron grating fixed in a frame which slides in a groove, to be removed and cleaned at pleasure, is attached to the well-chamber, and forms the strainer, placed 4 feet below the surface of the lake, through which the water passes into the well-chamber and out at the inlet pipe.

When this work was suspended last fall every preparation had been made to complete the job with dispatch, but owing to boisterous weather it was found impracticable to dredge or drive piles, consequently the work was postponed until next summer; then when favorable weather will permit the resumption of this work, it may be completed in a very few weeks. To completely finish the lake work will cost $8,000.

AQUEDUCT.

The aqueduct is built of brick and connects with the inlet pipe immediately at the lake shore; it there receives the water brought from the source of supply by the inlet pipe and conveys it to the pump-well at the engine house, a distance of 3,000 feet. The shape of the aqueduct is oviform, its horizontal width inside is 4 feet, and its vertical height 5 feet. The thickness of annular ring of brick 8 inches. The bricks are laid in two distinct rings on their edges, bonded with cement. The aqueduct is provided with gates and strainers covered with appropriate houses at each end of the line. The gateways afford the means of letting on or shutting off the water from the engine house and lake, to make any necessary repairs or clean out the aqueduct at pleasure. At intervals of every 500 feet ventilators are erected with opnings and suitable covers to admit the workmen for inspecting any portion of the work.

The foundation of the aqueduct was prepared somewhat different from that for the engine house. The marsh and quicksand material, which was extremely difficult to handle, was penetrated to the depth of 12 feet, by driving sheet piles a little in advance of the cut, and by using steam pumps constantly day and night. In the bottom of the trench thus made, three continuous lines of oak sills, 8 by 12 inches, were solidly embedded. On the sills 3-inch oak flooring was securely spiked down, and on this foundation a permanent bed of gravel and sand was laid, in which the exact form of the aqueduct was struck. The masonry was then commençed and the gravel carried up to the top of the brick work; the balance of the trench was back-filled with common earth material. The upper half of the equeduct received a good coat of hydraulic cement made perfectly impervious to water. Throughout the work, hard burnt waterproof bricks were used, well wetted and laid in hydraulic mortar. Notwithstanding the many practical difficulties which attended the progress and execution of this job, the work has been faithfully done and will last for ages.

The construction of the aqueduct, including the tunnel under the railroad, has cost	$35,548 65
To entirely complete the work in the various details	2,325 00
Total cost	$37,873 65

ENGINE HOUSE FOUNDATIONS.

The engine house grounds are 341 1-2 feet front and 360 feet deep, embracing 2 8-10 acres.

At the time the site was selected for the engine house, the examinations were made by laying plank over the then wet and swamp land, for a distance of several hundred feet, to reach the margin of Old River Bed. The spot where the building stands was probed with a 3-4 inch round iron rod to the depth of 24 feet, with a force equal to 600 pounds, exerted by four men. Still no other more permanent ground for a foundation suited to the purpose in view, could be procured, which afforded short and direct communication with the lake and reservoir.

Preparatory to commencing the foundations of engine house a roadway was made by carting earth from the neighboring high grounds over the marsh to afford means of transit to and from the work. A well was dug some 20 feet from the excavation, 15 feet deep, between which a drain was cut to the bottom of the well. In the well a chain pump was inserted, with horse power applied, which was kept constantly in motion. The workmen first cut through 4 feet of alluvial deposit, and struck a stratum of blue quicksand [illegible] netrated with very great difficulty by aid of all the pumps that could be worked by hand, and machinery, to the depth of 13 feet below the surface of the marsh. The contractor could go no deeper; the material to be removed became so thin and fluid it could not be handled with shovels.

At the bottom of the excavation a second probing was instituted, when a rod of wood 1 1-2 inches square was forced down 12 feet with the force of one arm. At this point the timbering was commenced. The first timber was laid to its place and firmly bedded by removing from under the timber a small portion of the quicksand at a time, and forcing in the space made clean coarse gravel and sand, well rammed under, and by mauling down the timber with heavy weights. The whole surface on which the foundations rest was covered with timbers in the same way. This finished the first course. The timbers are 12 inches square, placed 12 inches apart, having all the spaces between them filled with concrete. A second course of timbers of the same size, and prepared in the same way, are laid across the first course. The whole is enclosed by driving a row of sheet piles to prevent the soft material from oozing out below the timbers.

On the foundation thus prepared the masonry was commenced by laying the first course of stone in blocks 1 foot thick, 2 1-2 feet wide, and 5 feet long, on which invert arches are turned over the whole surface, to support a system of vertical walls crowned with top arches, to receive and equally distribute the weight and thrust of the engine house, pumping engines and stand-pipe over the foundations. The foundations of stone are 108 2-3 feet long, 56 1-3 feet wide and 21 feet deep from the top of the timbering to the engine room floor.

All the masonry is laid in regular courses of sandstone (from the best quarries), 12 inches thick. From the timbering, to 2 feet above the surface line of Lake Erie, is laid in hydraulic cement; above that line the masonry is carried up with good common mortar well grouted in every course.

The cost of the foundations, including the timber, was $21,690.24.

SUPERSTRUCTURE.

The engine house is built of brick laid wet in the walls in sound and regular bond, every joint being well filled with mortar and grouted in every course. Various anchors, ties and braces of iron were introduced to connect the masonry in every possible way, calculated to strengthen and support the building. Arches were turned over every opening in the masonry. The joints on the interior, as well as the exterior surface of the house, were struck smooth and painted. Throughout the masonry, for every four courses of stretchers a course of headers was laid. No toothing together any parts of the work was permitted.

The tower, enclosing the stand pipe, forms a part of the gine house, and projects 95 feet above the brick masonry. framing of the tower starts from an iron entablature in the room, supported by four strong iron columns and

The sills and uprights are of wood, securely fastened to the iron entablature. The tower is slightly conical on the outside, but cylindrical in the inside, formed on centers covered with staves matched and gauged to 1 1-4 inches thick and 6 inches wide.

At the top of the tower a square projection lookout, with cornice mouldings and railing, adds to the relief and finish of the shaft, and affords an excellent view of the lake and city.

To reach the lookout and for lateral support to the tower, a continuous spiral stairway is built from the engine room floor to the lookout. At stated distances between the top and bottom of the tower, small window lights and ventilators are placed on the line of stairway. The whole exterior surface of tower and engine house roof is covered with heavy tin plate, well coated with mineral paint.

The main building, containing the pumping engines, is 46 1-2 feet front, 52 1-2 feet wide and 48 feet high to the cornice; entire length of house, 105 feet.

The chimney is made of boiler plate riveted, and stands 120 feet high, and 10 feet from the building. It is used in common for both steam furnaces, by uniting the flues built of brick, which are carried outside the building, forming a common point of junction at the chimney. Flue gates at the rear of the furnaces are made to open and shut at pleasure, which regulate the direction of the smoke as required. It was the original design when the present iron chimney wears out, to build an independent brick stack for each furnace. Iron has been substituted temporarily, fearing that the immense weight and thrust of a brick stack placed so near the building would settle and injure the foundation of the engine house.

The engine house is a work of the most substantial and durable character. The house stands firmly on its foundation without the slightest indication of a crack or blemish. The works have been in operation several months. While the pumping engines are in action there is no more shake to the building than if it had grown to solid rock.

In order to meet any lateral pressure, and prevent the soft material oozing out from under the foundation of the engine house, superincumbent weight was applied for a considerable distance around the building by a deep fill and load of earth, to equalize the downward pressure and solidify the ground about the foundation.

It is believed by able architects who have thoroughly examined the engine house and plans upon which it was built, that there is not a more reliable and permanent building, and one better adapated in its arrangement, to the purpose in view, in the country.

The engine house grounds are covered with a coating of earth th[illegible]ick, and enclosed with a wood picket front fence, and [illegible]h a substantial rough fence enclosure. In other [illegible]ds are generally well improved with brick walks, This site commands an excellent landing for vessels, and coal delivery, at the dock on Old River Bed. The dock is built of strong durable timber and piles, capped with thick oak plank, all securely framed and fastened in the best manner, and is intended to store at least a half year's supply of fuel.

As soon as practicable coal bins, workshop, and a place for general storage of tools, tackle and various appliances required in the attendance and repairs of the works should be built on the engine house grounds. See plans and estimates.

The cost of the engine house, dock and other improvements as now finished	$47,415 26
Required but unfinished improvements	86 00
Total	$47,501 26

PUMPING ENGINES.

The water for the supply of the city is elevated by two purely Cornish beam engines, exact duplicates, each capable of furnishing a supply. They are worked alternately week about, and are of the following dimensions, viz.:

Steam cylinder 70 inch diameter and 10 feet stroke of piston. Walking-beam is double and unequal; the long end from the steam cylinder to fulcrum is 15 feet 11 inches. The short end from plunger to fulcrum is 13 feet 11 1-2 inches. Whole length of beam between end centers, 29 feet 10 1-2 inches; width across the widest part of beam, 6 feet 8 inches; weight of beam with center shaft, 40 tons.

Working velocity of engine at maximum, 10 strokes per minute. The engine making 9 strokes per minute under full load exerts 120 horse power. Available power of engine, 200 horse.

Connected with each engine, there are 3 boilers, 6 feet diameter and 28 feet long; each boiler contains a firebox and four flues. The two upper flues are 17 inches diameter, and the two lower ones 15 inches diameter.

To the short end of the beam is attached the plunger of main forcing pump. The plunger is 30 inches diameter; stroke 8 feet 9 inches. The load on the plunger necessary to force the water to the reservoir is equal to a column of water 150 feet high with the friction of the engine, and that required to overcome the passage of water through the pump main to the reservoir, which is 24 tons. Each stroke of the plunger elevates 320 U. S. gallons of water into the reservoir.

Total cost of the two engines set up and put into successful operation, $85,798.95.

The Cornish engines for the Cleveland Water Works are the first of the kind erected west of the mountains. They were built at the Allaire Works, New York. For strength, reliability, excellence and beauty of finish, they have no superiors in the known world. They have been in operation for several months. From the first day they were set to work up to this time, they have never failed in the slightest particular to fulfill all that is expected, machinery in its perfection can perform. The experience with them confirms the good opinion formed of the plan when adopted. Too high an estimate cannot be placed upon the value and character of these engines. They are monuments to the Allaire Works, and the enterprise of the City of Cleveland.

STAND PIPE.

The stand pipe is directly connected with main pumps and pipe leading to the reservoir. The stand pipe is made of boiler plate 3-8 inch thick at the bottom, tapering to 3-16 inch thick at the top. It is 4 feet diameter at the bottom, 36 inches diameter at the top, and 148 feet high above the engine room floor. Height of water in the stand pipe, when on a level with the top water line at reservoir, 138 feet above the engine room floor. Weight of column of water in stand pipe, 80,000 pounds.

PUMP MAIN.

The pump main connects with the stand pipe inside the engine house. It is 24 inches inside diameter, and 2,238 feet long. It receives the water from the pumps at the stand pipe and conveys it to the reservoir. Cost of pump main and stand pipe, $25,-232.46.

RESERVOIR.

The grounds for reservoir front on Franklin, Kentucky and Duane streets, and embrace 6 15-100 acres. The reservoir is built in part on a ridge 30 feet higher than any other ground found in the city. The south end of the embankment is about 7 feet lower than the north end. The exact base of the reservoir as it rests on the surface of the ground covers 4 acres. Measuring a horizontal plane touching the foot of the slope on the north side, the reservoir dimensions are at this assumed base 332 feet wide by 466 feet long. To measure the curvature of the ground surface would make the length considerably greater.

The reservoir is constructed of earth by first raising a solid embankment 22 feet above the assumed base, to obtain the desired elevation and foundation, upon which are raised the retaining embankments, which are 24 feet high, 16 feet wide at the top, and 96 feet wide at the bottom. The outside slope is 1 1-2 to 1, and the inside slope 1 3-4 to 1. There is a middle or division embankment 12 feet high, 10 feet wide at the top, and 52 feet wide at the bottom, which divides the reservoir into two compartments, one of which is used when it becomes necessary to repair or clean out the basins.

The inside of the reservoir is lined with impervious clay puddle, 2 feet thick. The whole basin is paved with hard burnt waterproof brick, laid flatwise on the bottom, and edgewise on the slopes. There are 160,875.95 cubic yards of earth in the embankments.

To prevent overflow and damage to the embankments, the reservoir is provided with a 20-inch waste pipe, at the top water
to carry off the surplus supply.

This pipe, from hurry on more important work, and from sickness of both engineers about the time the embankments were finished, was not put to its place; but everything is in readiness to lay the pipe as early as the spring weather will permit, at a cost not to exceed $1,000.

Every portion of the reservoir surface, except the terrace and lining of the basin, is turfed with sod. The summit of the retaining embankments is well graveled, forming a terrace walk eight feet wide.

Inside of the terrace walk is a neat wood picket fence, which has received three coats of best quality white paint, sanded.

In the bottom of the basin are four cavities sunk four feet deep, four feet wide and eight feet long; each cavity is paved on the bottom with three courses of brick, and curbed with two feet walls, laid in hydraulic mortar, on which a capping of stone is placed, and rabbited out to receive each a strainer over the mouth of the outlet pipe, which passes from the cavity under the bottom of the basin, through the embankments, into the street. There are two outlet pipes. One of 20 inches diameter, for supplying the eastern part of the city, is conveyed from the reservoir down the hillside, where a 24-inch double riveted boiler plate pipe, 100 feet long is laid over the contemplated cut for the Mahoning Railroad; thence under the Ship Canal to Cuyahoga River, where a 24-inch double riveted boiler plate pipe 232 feet long, is laid across under the bed of the river, at a depth of 19 feet below the surface of the water, at the lowest stage of the river, and 6 feet below the river bed. The river pipe connects again with the 20-inch main, extending on Superior street, through the Public Square into Euclid street, and terminates at present at Erie street, a distance of 10,000 feet from the reservoir.

The main pipe, for the supply of the city west of the Cuyahoga river, starts at the reservoir, 20 inches diameter, reduced to 16 inches diameter, and extends on Franklin street 1,500 feet to Franklin place. The intimate connection which these pipes have with the reservoir, as the main junction of the whole system of supply, has brought them to notice in this place.

Returning to the reservoir, and the peculiar circumstances of its construction, presents this branch of the Water Works as the most important features of their entire organization. There was but one elevated spot, with scarcely any table land, that could be found anywhere about the city, upon which to locate a reservoir. The earth material was very scarce; the only available supply was that found in a ridge of land of some 16 feet average height, 200 feet base by about 3,000 feet long, lying east and west, between Franklin and Woodbine streets, on private lots; the right to use which, by grading down the lots to a level with Franklin street, was conceded with great reluctance by the owners, at considerable cost to the Water Works. However, there were several exceptions, where liberal and enterprising citizens came forward and tendered the material on beautiful building sites to the Water Commissioners without a consideration. In this way the earth material to build the reservoir was obtained.

The reservoir work throughout was executed in the best workmanlike and satisfactory manner. The earth deposited was distributed in layers 10 inches thick, over the whole surface, and subjected to the cartage and tread of the horses before a new layer was laid on. To make the work compact, and to perfectly unite each and every portion of it, a copious supply of water was applied by hose and jet, to saturate and amalgamate the earth. For faithful construction and durability, the reservoir is of that character, if properly taken care of, will last for ages.

Total cost of reservoir, including waste pipe yet to be laid	$58,358 75
Cost of real estate	22,124 92
Cost of improving grounds and fences	2,106 21
Total	$82,589 88

WATER PIPES.

The main pipes already noticed, 20 inches diameter and 16 inches diameter, are the arteries to two different systems of supply. Each one is designed to be independent of the other; so that on either side of the river, the residents may have an uninterrupted supply of water, in the event of accident to any part of the system on the opposite side.

The distributing pipes, with their diameter and extent, as laid through the different streets for circulation of water, on both sides of the river, will be found in the subjoined supplementary report of the resident engineer:

Total cost of Water Works up to Jan. 1, 1857	$513,597 51
Estimate cost of laying inlet pipe	8,000 00
Reservoir waste pipe	1,000 00
Various other items	4,115 48
	$526,712 99

The Cleveland Water Works were commenced on the 10th day of August, 1854, and were so far completed as to let water on the city on the 19th day of September, 1856. The time required to build the works was two years and thirty-nine days.

The capacity of these works to deliver water is greater than the originally estimated wants of the population the works were intended to supply, which was for 100,000. They are, however, capable of supplying at least 200,000 inhabitants with abundance of water. By an enlargement of the main pump barrel and plunger to each Cornish engine, which was contemplated in the plans, the supply may be increased to almost an unlimited extent. No fear can be entertained that the present Water Works in the next fifty years will fail to yield a superabundant supply of water.

The water was first introduced into the city temporarily at the earnest solicitation of the Mayor, Common Council and Trustees of Water Works, in which the citizens generally participated, on the occasion of the State Fair, on the 24th day of September, 1856. Apart from the Fair, this event was hailed with demonstrations of great joy as the celebration of the introduction of the waters of Lake Erie into the City of Cleveland.

At the intersection of the roadways, crossing at the center of the Public Square, a capacious fountain of chaste and beautiful design was erected, from which was thrown a jet of pure crystal water high into the air, which, as the center greatest attraction, gratified thousands of admiring spectators.

It became necessary after the Fair to shut off the water, as was anticipated, to remove a few pipes near the Ship Canal, which had broken in two by the unequal settling of the pipes in the quicksand bed through which they were laid. These repairs were promptly made, and the water let on the city again; since which time the supply has been regular and uninterrupted.

Taking the past experience of the various Water Works in this latitude as a guide, special pains were taken in laying the distributing water pipes, to place the top of the lines four feet below the surface of the streets, to get below the reach of frost. Notwithstanding this precaution, the unprecedented and continued freezing weather of the past winter penetrated the ground to the depth of the pipes and below them. Several of the small lines at particular points were frozen solid inside with ice which burst them. These accidents were common to all the Water Works in the country. It is advisable to lay pipes in future lower; yet difficulties of this kind may never happen again. When an active circulation is created by the increased demand and consumption of water, and due precaution is taken to protect the fire plugs and stop-gates from frost, by applying horse manure as a non-conductor, no danger need be apprehended from freezing.

In conclusion, I beg leave, contrary to my usual custom, because I consider that due courtesy and justice demands it, to remind your board of the important service rendered by Mr. Joseph Singer, my former assistant, and now resident engineer of the works. Although unsolicited, I cannot pass unnoticed the valuable aid he rendered in the construction of the Cleveland Water Works. In every department to which I have confided in him a trust, or management, has been faithfully and satisfactorily discharged. For skill, energy and integrity, I recommend him to your favorable consideration. He merits my unbounded confidence and respect. Respectfully submitted,

T. R. SCOWDEN,
Chief Engineer C. W. W.

SUPPLEMENTARY REPORT

Upon the Condition of the Water Works at the End of the Year 1856, and a Statement of the Improvements Necessary for their Completion.

I. AQUEDUCT.

It will be observed by the foregoing report of the Chief Engineer, that the inlet pipe in the lake could not be laid last year, and a temporary waterway was constructed of wood as a substitute. This has been attended with considerable expense to keep up a sufficient supply of water to the pumps, from the washing of sand and the gorging of ice during the past season, but will be dispensed with when the inlet is laid.

The cut through the C. & T. Railroad made for the aqueduct yet to be filled, requires about 1,800 yards of filling and the shaping of the railroad embankment at 25 cents per yard, will cost $450.

The lake work has required the constant attention of the engineer, as upon its condition the pumping engines were chiefly dependent for safety of working and an ample supply of water through the aqueduct.

Frequent inspections of this important branch of the works will always be necessary. When the cut in the railroad is filled, the engineer will be compelled to ascend the steep embankment of the railroad every time he goes to the lake, and in case of an accident all necessary tools and materials have to be brought to the lake the same way.

In order to obviate the necessity of transporting tools and every sort of implements for facilitating the work of construction, and keeping the lake work in proper repair, I would suggest the propriety of lining the tunnel through the railroad with brick masonry about 6 feet wide and 8 feet high, grading the bottom of it level with the land on the lake shore, and provide doors to open and close it at pleasure.

The tunnel would afford a quick and easy communication with the lake, and materials and tools could be deposited here, and brought in requisition without loss of time, in case of emergency.

The cost of brick lining the tunnel is estimated at $1,200.

On the line of the aqueduct south and southeast of the railroad some 800 yards of back filling will be required at a cost of 12 1-2 cents per yard, or total cost of $100.

The back filling is essentially necessary to the safety of the aqueduct, as it will give the spring water from the hill an easy flow to Old River Bed, and prevent any washing or injury to the aqueduct.

Further precautions are necessary by way of constructing drains to convey the rainfall from the hillside and bottom land to Old River Bed, without damage to the aqueduct. It has been observed after heavy rains, that the strong currents of water passing rapidly over the aqueduct, have washed away the earthwork and softened the already treacherous and yielding ground.

The aqueduct being built in very loose earth, which would, when once saturated with water, cause unequal settling and must crack the masonry, unless protected.

The construction of necessary protections will cost $75.

It is important that the two gateways on the line of aqueduct should be completed according to the original design; in its present state there are no means of shutting off the water from the aqueduct or the engine house.

The cost of gates and appendages will be $500.

II. ENGINE HOUSE AND ENGINES.

The building is in a very good condition. The stone base of the iron chimney needs some repairs. The expansion and the shaking of the chimney by heavy winds have cracked the north side of this stone base, which should be taken down, rebuilt and securely tied with iron anchors at an expense of about $30.

The construction of brick or stone gutters on the north side of the engine house to carry off the rain water and prevent any damage to the foundation is indispensable.

Probable cost, $15.

The brick gutters on the south side should be so arranged as to form large receptacles at their angles with the building to permit a more free escape of water down the conducting pipes, which improvement will cost $6.

The cleansing of the boilers discharges a large quantity of water over the roadway leading from the boiler room, once every month. Without suitable protection the water discharged will soon undermine the retaining walls and otherwise do considerable damage.

The expense of paving the roadways, and the necessary protections, will require 70 yards of sandstone pavement, at 50 cents per yard, amounting to $35.

The engines are in excellent order, and have been improving in their economy of working from the first.

On and after the 1st of January, 1857, a regular record of their duty was kept at the engine house, and there is no doubt but that at the end of the year a very satisfactory duty can be presented.

III. RESERVOIR.

This part of the works is in excellent condition, and wants only a few additions to be complete.

The waste pipe should be put in as early in the spring as practicable, so that the turf could be relaid before it commences growing. For the safety of the reservoir the water never should rise higher than 20 feet, as was intended, which renders the use of the waste pipe absolutely necessary.

The cost of the pipe and laying will be $1,000.

The cost of repairs to the reservoir machinery will not exceed $25.

IV. WATER PIPES.

The appended schedules give the extent of the pipes, and the names of the streets, in which they are laid; also the places and numbers of the stop-valves and fire hydrants on the lines of pipes.

The comparatively few breaks and leaks of pipes since the introduction of water into the city, proves the excellent quality of the pipes and the superior workmanship in laying the same.

The table below gives a statement of all the leaks that occurred and were repaired last year.

STREET.	Diameter of Pipe in Inches			Total	CAUSE OF LEAK.
	24	20	8		
Kentucky	1	......	......	1	Cracking of pipe crosswise, near Franklin street.
West River	......	2	......	2	Cracking of pipe crosswise, west of old ship canal.
Superior	......	1	......	1	Cracking of pipe crosswise, next to Railroad crossing.
Ontario	......	......	1	1	Bursting of pipe by shutting valve, near Prospect street.
Kentucky	1	......	......	1	Loosening of lead in joint, near engine house.
Hanover	......	1	......	1	Cracking of pipe crosswise, between Clinton and Franklin streets.
Total..	2	4	1	7	

Besides these leaks several wooden plugs started from ends of branches and pipes, but they were replaced and secured without interrupting the supply of water.

The temporary protections of the river pipe at the shores of the river will be taken off and good substantial ones substituted, which, with the expense of making a permanent protection against frost and all other accidents, will amount to $400.

All other pipes and attachments are in good order, with the exception of a few stop-valves, broken by the frost, which require repair.

Six fire hydrant connections were frozen by exposure from the depth of the street gutters. To prevent its recurrence the 3-inch branch pipes will be laid deeper in future.

During the intense cold weather several service pipes froze and deprived the consumers of a water supply. Serious inconvenience and trouble was experienced in thawing these pipes out, even this expedient sometimes failed.

Plans and estimates for the erection of a workshop on the engine ho d were submitted to the board last fall.

Whether it will be considered policy to build a shop or to continue to rent the one previously used, is left to the decision of the trustees. But the maintenance of the shop at Mr. Ashcraft's foundry, is more expensive. The foundry itself is not in operation; to do a little job requires raising steam and loss of time at a heavy expense of fuel and attendance; while we have a small engine admirably adapted to the purpose, which in a new shop would furnish power at a nominal cost.

The establishment of a pipe yard is very desirable for storing pipes, valves and other machinery and materials, belonging to the works. The location of this yard should be central at such a place, where water for testing pipes could be easily furnished.

In such a locality the convenience afforded would be far greater than on the reservoir or engine house ground, both being too remote from the central part of the city, where water pipes are already and very likely will be generally extended.

The distance of hauling the pipes from the reservoir and engine house ground would be too great. The difficulty ascending the grade of Kentucky street is a serious objection.

Could a site for a pipe yard be selected large enough to permit the erection of a workshop upon it, would also be desirable.

A list of pipes and attachments, tools and other implements on hand, which are now stored at different points, is also given in the annexed schedules.

A map of the city on a large scale for office use and reference, showing all the water pipes laid, and all the various connections made with them, is now ready for laying out the lines of pipes, and as soon as the weather will permit, the accurate measurement of the situations of valves, hydrants, and so forth, to be taken and laid down on this map.

All of which is respectfully submitted.

J. SINGER,
Resident Engineer, Cleveland Water Works.

Office of Water Works,
Cleveland, February 20, 1857.

SCHEDULE A.

Showing the Pipes Laid.

Diam. of Pipes in Inch.	In What Streets.	Between What Streets.	Feet Laid.	Total Feet.	Remarks.
24	Kentucky	From engine house to reservoir	2,238		inc. disch. pipe.
24	Detroit	Mahoning R. R. crossing	100		Wrought iron pipe.
24	Und. Cua. R.	West River to Superior	230		wrought iron pipe.
			——	2,668	
20	Franklin	In the reservoir	350		outlet for West side.
20	Franklin	Kentucky to Hanover	1,655		inc. outlet for East side.
20	Hanover	Franklin to Detroit	1,112		
20	Detroit and W. River	Hanover to west shore of river	2,910		opp. Superior.
20	Superior	East shore of river to Euclid	2,925		crossing the Public Sq.
20	Euclid	Public Square to Erie	1,500		
			——	10,562	
16	Franklin	Reservoir to Franklin place	1,168		inc. conn. bet. 20 in. and 16 in. main.
16	Erie	Superior to Prospect	1,440		
			——	2,608	
10	Prospect	Ontario to 360 feet east of Perry	5,205		commencing 118 ft. E. of Ontario street.
			——	5,205	
8	Ontario	Lake to Pittsburgh	2,693		
8	Prospect	Ontario, eastwards	118		to 10 in. line.
8	Pittsburgh	Ontario to Kinsman	1,000		
8	Kinsman	Pittsburgh to Eagle	300		
8	Vineyard	Crossing under Canal	160		
8	Kentucky	Washington to Reservoir	1,800		
8	Kentucky	In the reservoir	350		
			——	6,421	
6	Water	Superior to Lake	1,485		inc. conn. with 20 in. line.
6	Vineyard	Superior to the Canal	710		inc. conn. with 20 in. line.
6	Euclid	Ontario to Perry	5,344		inc. conn. with 20 in. line.
6	Prospect	360 feet east of Perry to Hudson	1,640		continuation of 10 in. line.
6	Kinsman	Eagle to Perry	3,300		
6	Detroit	On intersection of Pearl	50		
6	Pearl	Detroit to Franklin	1,285		
6	Franklin	Pearl to Kentucky	1,890		commencing 300 ft. E. of Kentucky, incld'g conn. with 16 in. line.
			——	15,704	
4	Superior	River to Erie	3,906		
4	St. Clair	Water to Erie	3,364		
4	Lake	Water to Erie	3,432		
4	Bank	Superior to Lake	1,445		inc. conn. with 20 in. line.

SCHEDULE A—Continued.

Diam. of Pipes in Inch.	In What Streets.	Between What Streets.	Feet Laid.	Total Feet.	Remarks.
4	Seneca	Superior to Lake	1,445	....	inc. conn. 20 in. line.
4	Public Sqr.	West and south side to Ontario	550	....	
4	Bond	Superior, towards Lake	83	....	
4	Rockwell	Ontario to Bond	1,210	....	
4	Erie	Lake to Eagle	3,853	....	
4	Walnut	Erie, towards Muirson	58	....	
4	Chestnut	Erie, towards Muirson	58	....	
4	Eagle	Erie to Kinsman	1,035	....	
4	Perry	Euclid to Prospect	500	....	
4	River	Superior to Front	2,252	....	
4	Lighthouse	River to Spring	434	....	
4	Meadow	Lighthouse, toward Front	321	....	
4	Spring	Lighthouse, toward St. Clair street.	300	....	
4	Centre	South side of Canal, towards Merwin	800	....	
4	Champlain	Vineyard to Canal street	320	....	
4	Canal	Champlain, towards Ontario	270	....	
				25,636	
				68,694	

Or 13 miles and 54 feet of pipes.

SCHEDULE B.

Showing the Number and Location of Stop-Valves.

No.	Water way in inch's	LOCATION.
1	24	In front of Engine House. (Pittsburg pattern with flanches.)
1	24	In front of Reservoir, 50 feet east of Kentucky street.
1	24	In front of Reservoir for connection, with 20-inch line.
3	24	VALVES.
4	20	In the Reservoir.
1	20	In front of Reservoir, for east supply main, 180 ft. east of Kent'y st.
1	20	In front of Reservoir, for connection with 24-inch rising main.
1	20	North side of Franklin place, between Ann and Hanover sts.
1	20	In Detroit street, 70 feet east of Hanover street.
1	20	In West River street, 300 feet west of Center street.
1	20	In West River street 45 feet west of corner opp. Superior street.
1	20	In Superior street, 130 feet east of dock line on River.
1	20	In Superior street on west line of Bank street.
1	20	In Euclid street, east street of Public Square.
1	20	In Euclid street, 50 feet west of Erie street.
14	20	VALVES.
1	16	In front of Reservoir, 320 feet east of Kentucky street.
1	16	In Franklin street, 100 feet west of Duane street, in connection between the 20-inch and the 16-inch supply mains.
1	16	In Erie street on south line of Euclid street.
1	16	In Erie street on north line of Euclid street.
4	16	VALVES.
1	10	In Prospect street, 250 feet east of Sheriff street.
1	10	In Prospect street, on west line of Erie.
1	10	In Prospect street, on east line of Erie.
1	10	In Prospect street, on east line of Brownell street.
1	10	In Prospect street, on center of Perry street.
5	10	VALVES.
1	8	In Ontario street, on south line of Lake street.
1	8	In Ontario street, on north line of Rockwell street.
1	8	In Ontario street, on south line of Superior street.
1	8	In Ontario street, opposite the Market House.
1	8	In Prospect street, on east line of Ontario street.
1	8	In Pittsburg street, 20 feet north of south line of Huron street.
6	8	VALVES.
1	6	In Superior street, on connection of 6-inch line for Water street, with the 20-inch supply main.
1	6	In Superior street, on connection of 6-inch line for Vineyard street, with the 20-inch supply main.
1	6	In Water street, on the north line of Superior street.
1	6	In Water street, on the south line of St. Clair street.

SCHEDULE B—Continued.

No.	Water way in inch's	LOCATION.
1	6	In Water street, on the north line of St. Clair street.
1	6	In Water street, on the north line of Lake street.
1	6	Vineyard street, on the north line of Champlain street.
1	6	Euclid street, on the east line of Ontario street.
1	6	Euclid street, on the east side of Public Square, on the connection, between the 20-inch main and 6-inch line.
1	6	In Euclid street, on the center of Erie street.
1	6	In Euclid street, on the east line of Erie street.
1	6	In Euclid street, on the east line of Brownell street.
1	6	In Euclid street on the east line of Huntington street.
1	6	In Euclid street on the center of Perry street.
1	6	In Prospect street, 1,100 feet west of Hudson street.
1	6	In Kinsman street, on the south line of Eagle street.
1	6	In Kinsman street, on the south line of Ohio street.
1	6	In Kinsman street, on the west line of Cross street.
1	6	In Kinsman street, 170 feet east of Cross street.
1	6	In Kinsman street, on the west line of Vine street.
1	6	In Kinsman street, on the east line of Perry street.
1	6	In Detroit street, on the west line of Pearl street.
1	6	In Pearl street, on the south line of Detroit street.
1	6	In Pearl street, on the south line of Franklin street.
1	6	In Franklin street, on the east line of Pearl street.
1	6	In Franklin street, on the west line of Pearl street.
1	6	In Franklin street, on the west line of Franklin place, in the connection between the 16-inch main and the 6-inch line.
1	6	In Franklin street, on the west line of Duane street.
28	6	VALVES.
1	4	In Superior street, on the east line of River street.
1	4	In Superior street, on the east line of Water street.
1	4	In Superior street, 20 feet west of east line of Bank street, in connection between the 20-inch main and the 4-inch line.
1	4	In Superior street, on the east line of Bank street.
1	4	In Superior street, 52 feet west of east line of Seneca street, in the connection between the 20-inch main and 4-inch line.
1	4	In Superior street, 29 feet west of east line of Seneca street.
1	4	In Superior street, on the west line of Public Square.
1	4	In Superior street, on the east line of Ontario street.
1	4	In Superior street, on the east line of Wood street.
1	4	In Superior street, on the east line of Erie street.
1	4	In St. Clair street, on the east line of Water street.
1	4	In St. Clair street, on the west line of Bank street.
1	4	In St. Clair street, on the west line of Seneca street.
1	4	In St. Clair street, on the west line of Ontario street.
1	4	In St. Clair street, on the east line of Ontario street.
1	4	In St. Clair street, on the west line of Wood street.
1	4	In St. Clair street, on the west line of Bond street.
1	4	In St. Clair street, on the west line of Erie street.
1	4	In Lake street, on the east line of Water street.
1	4	In Lake street, on the east line of Bank street.
1	4	In Lake street, on the east line of Seneca street.
1	4	In Lake street, on the east line of Ontario street.
1	4	In Lake street, on the east line of Wood street.
1	4	In Lake street, on the east line of Bond street.
1	4	In Lake street, on the east line of Erie street.
1	4	In Bank street, on the north line of Superior street.

SCHEDULE B—Continued.

No.	Water way in inch's	LOCATION
1	4	In Bank street, on the south line of St. Clair street.
1	4	In Bank street, on the north line of St. Clair street.
1	4	In Bank street, on the south line of Lake street.
1	4	In Seneca street, on the north line of Superior street.
1	4	In Seneca street, on the south line of St. Clair street.
1	4	In Seneca street, on the north line of St. Clair street.
1	4	In Seneca street, on the south line of Lake street.
1	4	In west street of Public Square, on the south line of Superior street.
1	4	In south street of Public Square, on the west line of Ontario St.
1	4	In Bond street, 15 feet south of north line of Superior street.
1	4	In Rockwell street, on the west line of Ontario street.
1	4	In Rockwell street, on the east line of Ontario street.
1	4	In Rockwell street, on the west line of Wood street.
1	4	In Rockwell street, on the east line of Wood street.
1	4	In Rockwell street, on the west line of Bond street.
1	4	In Rockwell street, on the east line of Bond street.
1	4	In Erie street, on the south line of Lake street.
1	4	In Erie street, on the south line of West St. Clair street.
1	4	In Erie street, in center of Superior street, in the connection between the 16-inch main and the 4-inch line.
1	4	In Erie street, on the south line of Superior street.
1	4	In Erie street, on the north line of Euclid street.
1	4	In Erie street, on the south line of Euclid street.
1	4	In Erie street, 12 feet south of south line of Huron street.
1	4	In Erie street on the south line of Bolivar street.
1	4	In Erie street, on the south line of Eagle street.
1	4	In Walnut street, on the east line of Erie street.
1	4	In Chestnut street on the east line of Erie street.
1	4	In Eagle street, on the west line of Erie street.
1	4	In Eagle street, on the east line of Kinsman street.
1	4	In Perry street, on the south line of Euclid street.
1	4	In Perry street, on the north line of Prospect treet.
1	4	In River street, 10 feet north of north line of Superior street.
1	4	In River street, on the north line of St. Clair street.
1	4	In River street, in a right angle with south corner of Lighthouse street.
1	4	In River street, on the south line of Front street.
1	4	In Lighthouse street, on the east line of River street.
1	4	In Lighthouse street, on the west line of Spring street.
1	4	In Meadow street, on the north line of Lighthouse street.
1	4	In Spring street, on the south line of Lighthouse street.
1	4	In Center street, on the east line of Columbus street.
1	4	In Center street, on the west line of Columbus street.
1	4	In Champlain street, on the east line of Vineyard street.
1	4	In Canal street, for connection of Champlain street.
1	4	In Canal street, in front of Lucas' brewery.
70	4	VALVES.
		RECAPITULATION.
3	24	VALV[illegible]
14	20	VAL[illegible]
4	16	V[illegible]
5	1	
6		
28		
1		

SCHEDULE C.

Showing the Number and Location of Fire Hydrants.

No.	IN WHAT STREET.	Side of Street
1	Franklin street, between Kentucky and Duane streets	South.
2	Franklin street, between Duane and State streets	South.
3	Franklin street, between Franklin Place and Pearl street	South.
4	Pearl street, between Franklin and Detroit streets	East.
5	Superior street, between Water and Bank streets	North.
6	Superior street, between Bank and Seneca streets	South.
7	Superior street, opposite Wood street	South.
8	Superior street, between Bond and Erie streets	North.
9	St. Clair street, opposite Academy Lane	South.
10	St. Clair street, between Seneca and Ontario streets	North.
11	St. Clair street, 100 feet west of Bond street	North.
12	Lake street, 55 feet east of Academy lane	South.
13	Lake street, between Seneca and Ontario streets	North.
14	Lake street, between Bond and Erie streets	North.
15	Water street, corner of Frankfort street	East.
16	Water street, 30 feet south of Lake street	West.
17	Lighthouse street, 100 feet east of River street	South.
18	River street, 260 feet north of Lighthouse street	East.
19	River street, 290 feet north of St. Clair street	East.
20	Vineyard street, 75 feet south of Superior street	West.
21	Canal street, in front of Lucas' brewery	South.
22	Center street, 190 feet east of Merwin street	North.
23	Rockwell street, opposite east street of Public Square	North.
24	Erie street, between Walnut and Chestnut streets	West.
25	Erie street, between Euclid and Prospect streets	East.
26	Erie street, between Huron and Bolivar streets	West.
27	Erie street, between Bolivar and Eagle streets	East.
28	Eagle street, 153 feet east of Kinsman street	South.
29	Euclid street, 108 feet east of Sheriff street	North.
30	Euclid street, 250 feet west of Oak alley	South.
31	Euclid street, 60 feet east of Muirson street	North.
32	Euclid street, 70 feet east of Dodge street	North.
33	Euclid street, 375 feet east of Huntington street	South.
34	Euclid street, between North Perry and Perry streets	North.
35	Prospect street, east side of Hudson street	South.
36	Prospect street, 600 feet west of Hudson street	North.
37	Prospect street, 1,250 feet west of Hudson street	South.
38	Prospect street, opposite Cheshire street	North.
39	Prospect street, 230 feet west of Huntington street	North.
40	Pittsburgh street, 190 feet north of Huron street	East.
41	Pittsburgh street, between Huron and Bolivar streets	East.
42	Kinsman street, between Ohio and Cross streets	South.
43	Kinsman street, between Pine and Vine streets	North.
44	Kinsman street, between Harmon and Perry streets	North.

SCHEDULE D.

Showing the Fuel, Tools, etc., at the Engine House and Grounds.

100 tons Coal.
4 gallons of Lubricating Oil.
23 gallons of Lard Oil.
10 lbs. of Beef Tallow.
70 lbs. of Mutton Tallow.
6 lbs. of White Lead.
35 lbs. of Red Lead.
50 lbs. of Cotton Waste.
196 lbs. of Hemp Packing.
1 Fire Shovel.
1 Coal Wheelbarrow.
2 Finisher Benches.
2 Bench Vises.
26 Files.
3 Saw Files.
6 File Handles.
42 Cold Chisels.
21 Drills
2 small sets of Stocks.
1 large set of Stocks.
5 sets of Dies.
3 sets of Taps.
2 Tap Wrenches.
3 Screw Wrenches.
3 Copper Hammers.
1 Ratchet Drill Brace.
1 Hack Saw.
5 Socket Wrenches.
24 Common Wrenches.
1 Hand Vise.
1 Hand Brace.
6 Bids.
1 Screw Bracket for Pump Valves.
1 Platform Scale.
3 Globe Lanterns.
3 Brass Hand Lamps.
2 Tin Hand Lamps.
6 Brass Oil Cans.
2 Tin Oil Cans.
2 Brooms.
2 Scrub Brushes.
2 Dusting Brushes.
1 Mop Handle.
3 Pails.
1 Tin Dipper.
5 lengths of Leather Hose.
2 Copper Nozzles.
2 Brass Nozzles.
1 Grindstone.
2 sets of 13-inch Blocks.
1 set of 9-inch Blocks.
1 set of 8-inch Blocks.
1 single 8-inch Block.
203 feet of 1½-inch Rope.
135 feet of 1⅛-inch Rope.
108 feet of 1-inch Rope.
260 feet of 2-inch Rope.
68 feet of 1⅛-inch Rope.
221 feet Lashing.
2 Stoves.
2 Coal Hods.
2 Shovels.
2 Pokers.
1 small Riveting Hammer.
1 Hand Saw.
1 Screw Driver.
1 set of Figures.
7 Iron Settees.
1 Table.
1 Inkstand.
2 Scoops.
1 Hook.
4 Sledges.
1 Pail.
1 Dipper.
3 Grate Bars for Small Engine.
30 Grate Bars for Cornish Boilers.
1 Worthington Pumping Engine.
1 Axe.
1 Oil Stone.
1 Large Knife.
2 Arm Chairs.
1 Chair Cushion.
2 pairs of Rubber Boots.
1 Rake.
1 Pick.
1 Crowbar.
1 two-inch Auger.
1 Spike Mall.
1 Cross-cut Saw.
100 Fire Bricks.
1 4-horse power Engine and Boiler.

SCHEDULE E.

List of Tools, Stock and Patterns at Workshop.

1 Lathe.
20 Wheels for Cutting Screws.
6 Face-Plates.
1 Universal Chuck.
7 Wrenches.
48 Turning Tools.
8 Chasers for Screw Cutting.
3 Drills.
26 Carriers.
15 Mandrils.
1 Centre Rest.
4 Hand Rests.
1 pair of Valve Cap Fasteners.
1 pair of Callipers.
1 pair of Dividers.
3 Taper Rings for Turning Valves.
4 Die Cutters.
11 pairs of Clamps.
2 pairs of Polishing Clamps.
1 Water Can.
1 Upright Drill Press.
27 Drills.
2 Rose Bits.
1 Wrench.
1 Hand Drill Press.
1 Sampson.
1 Grindstone.
4 Bench Vises.
23 Chisels.
2 Hand Hammers.
210 Files.
20 File Handles.
2 Square Hand Rimmers.
1 Hack Saw.
1 pair of Shears.
4 Gauges for Valve Sharts.
2 Screw Wrenches.
1 Hand Drill Brace.
2 Boring Bits.
1 Belt Punch.
1 Side Lace Leather.
1 Iron Square.
6 Screw Plates.
25 sets of Dies.
45 Taps, from ⅛ to 1¾ inch.
6 unfinished Taps.
14 Tap Wrenches.
5 sheets of Tin.
6 lbs. of Emery.
10 lbs. of Rosin.
3 Drifts for Bolt Heads.
1 Press for Calking Valves.
6 Gasket Moulds for Valves.
10 Calking Tools.
4 Lead Ladles.
6 sets 10-inch Clamps.
2 sets 16-inch Clamps.
2 sets 20-inch Clamps.

4 Caps for testing Valves.
4 pairs of Clamps for same.
2 lengths of Leather Hose.
2 Valve Wrenches.
1 Furnace for melting lead.
6 Melting Kettles.
1 Hand Lamp.
2 large Oil Cans.
3 small Oil Cans.
1 pair of Hand Bellows.
2 Stoves and Pipes.
8 Pans of Glass.
1 Desk.
1 Slate.
1 Inkstand.
3 Pails.
1 Glue Pot.
1 pair of Blacksmith Bellows.
1 Anvil.
2 Sledges.
1 Swedge Block.
20 pairs Tongs.
25 Heading Tools.
13 Bottom Swedges.
12 Top Swedges.
9 Fullers.
4 Hook Formers.
29 Drifts.
3 Set Hammers.
6 Punches.
5 Chisels.
1 Flatter.
1 Nut Stamp.
14 Nut Mandrils.
4 Bolt Gauges.
2 pair of Callipers.
1 pair of Dividers.
1 lot of Valve and other Patterns.
2 2-inch Brass Cocks, with Flanches.
1 Ladder.
A large lot of partly finished Valves and Valve Castings.
187 Bolts.
6 Stirrups for Fire Plugs.
1 bbl. of Iron Borings.
1 Hydraulic Pipe Press.
1 8-inch Pipe, with Brass Cock for testing Valves.
16 bars of square Iron.
20 bars of flat Iron.
13 bars of round Iron.
1 plate of Boiler Iron.
1 bar of ⅞-inch Octagon Steel.
1 bar of ⅞-inch flat Steel.
4 hexagon Nut Blocks.
6 sets 4-inch Clamps.
2 Post Augers.
1 Fire Stand.

SCHEDULE E—Continued.

2 Water Pails.
2 bbls. Scrap Iron (wrought.)
1 Cast-block for bending Stair-stringers.
4 Bolts, 15 ft. long, 3 in. in diam.
2 Bolts, 15 ft. long, 2¼ in. in diam.
2 bars round Iron, 13 ft. long, 2¾ in. diam.
1 bar round Iron, 6 ft. long, 2½ in. diam.
1 lot wrought Scrap Iron.

SCHEDULE F.

List of Tools for Pipe Layers and Street Men.

39 Picks.
30 Shovels.
2 Sledges.
3 Calking Tools.
18 Calking Chisels.
5 Cold Chisels, with Handles.
19 Cold Chisels.
5 Calking Hammers.
7 Clay Boards.
2 Clay Pails.
2 Water Pails.
1 Dipper.
1 Hatchet.
1 Axe.
1 Buck Saw.
1 Wheelbarrow.
3 Furnaces.
3 Melting Kettles.
1 Pipelayer's Line.
6 Ladles.
3 Hand Tool Boxes.
4 large Tool Boxes.
2½ coils of Packing Yarn.
1 Hand Ram.
7 common Wrenches.
2 Crowbars.
1 Handspike.
2 Ropes, 1-in. diam., 25 ft. long.
12 pieces of Pump Chain.
1 8-inch Plug.
1 Paint Pot, with Red Lead.
1 3-inch Tin Pump.
34 6-inch wrought Spikes.
1½ keg of Nails.
1 Chain Pump Handle.
18 sets of Clamps.
10 sets 6-inch Bands.
4 sets 8-inch Bands.
6 Clamp Cross-bars.
1 Pig Lead.
15 Hammer Handles.
3 yards Rubber Belt, 5 inches wide.
2 lengths of Leather Hose.
1 Oil Can.
29 Bolts and Nuts.
4 Hooks.
46 ¾-inch Washers.
79 ⅛-inch Washers.
1 Lantern.
1 Drill Stock.
2 pair Drilling Clamps.
6 Drills.
2 Rimmers.
12 Street Wrenches.
1 Screw Wrench.
1 Tape Line.

SCHEDULE G.

Statement of Pipes and Attachments on Hand.

2 pieces of 24-inch Pipe tog, 8 feet long.
3 whole 20-inch Pipes.
10 pieces 20-inch Pipe tog., 29 feet long.
1 whole 16-inch Pipe.
6 pieces 16-inch Pipe tog., 24 feet long.
1 piece 10-inch Pipe, 3 ft. 4 in. long.
10 whole 8-inch Pipes.
6 pieces 8-inch Pipe tog., 13 ft. long.
5 pieces 6-inch Pipe tog., 36½ feet long.
9 whole 4-inch Pipes.
6 pieces 4-inch Pipe tog., 30 ft. long.
1 8-inch + Pipe.
1 6-inch + Pipe.
13 4-inch + Pipe.
3 10-inch T Pipe.
4 8-inch T Pipe.
1 4-inch T Pipe.
1 24-inch Sleeve.
1 20-inch Sleeve.
1 16-inch Sleeve.
6 10-inch Sleeve.
1 8-inch Sleeve.

SCHEDULE G—Continued.

1 6-inch Sleeve.
4 pairs 6-inch Socket Clamps.
1 pair 4-inch Socket Clamps.
3 pairs 24-inch Clamps.
2½ pairs 8-inch Clamps.
2 pairs 6-inch Clamps.
1 pair of 4-inch Clamps.
1 Fire Hydrant, complete.
1 Trumpet Pipe, from 36 to 24 inches.
1 Reducing Pipe, from 24 to 20 inches.
1 Reducing Pipe, from 16 to 10 inches.
1 Reducing Pipe, from 16 to 8 inches.
3 Reducing Pipes, from 10 to 8 inches.
2 Reducing Pipes, from 10 to 4 inches.
1 Reducing Pipe, from 8 to 4 inches.
7 Reducing Pipes, from 8 to 3 inches.
7 Reducing Pipes, from 6 to 3 inches.
45 Reducing Pipes, from 4 to 3 inches.
6 6-inch Y Pipes.
4 4-inch Y Pipes.
2 20-inch Curves.
7 10-inch Curves.
6 8-inch Curves.
4 6-inch Curves.
17 4-inch Curves.
1 24-inch Valve.
2 20-inch Valves.
3 10-inch Valves.
2 8-inch Valves.
14 6-inch Valves.
14 4-inch Valves.
2 8-inch Drain Valves.
2 Valve stands for Reservoir.
2 6-inch Pipe Caps.
1 Flexible 6-inch Pipe, 16 feet long.
260 ⅝-inch Ferrules.
385 Hydrant Numbers.
3 tons broken Pipe and Scrap Iron.

SCHEDULE H.

Office Furniture, Stationery, Etc.

2 Desks.
1 Bureau for Drawings.
6 Cane Seat Chairs.
2 Stoves and Pipes.
2 Coal Shovels.
2 Pokers.
2 Coal Scuttles.
3 printed Maps of Cleveland.
2 drawn Maps of Cleveland.
4 quires of Paper.
2 Feather Dusters.
1 Letter-press and Stand.
1 Bottle of Ink.
½ Bottle of Copy Ink.
2 Tumblers.
1 Pitcher.
A full complement of Plans, Maps, and Sketches for Water Works.
A quantity of printed Specifications.
1 Axe.
1 Round Table.
2 Drawing Tables.
1 Cushioned Chair.
1 Copper Kettle for Stove.
3 Drawing Boards.
2 Curve Rules.
1 Parallel Rule.
2 Drawing Scales.
3 Inkstands.
2 dozen Drawing Pencils.
1 Broom.
1 Level, Tripod and Rod.
6 Center Rods.
1 Measuring Chain.
25 lbs. of Drawing Paper.
3 yds. of Tracing Cloth.
1 Picture (Fountain), Frame & Glass.
1 Clock.
1 Sprinkling Pot.
Samples of Lead Pipes, Iron and Brass.

I.

To the Trustees of Water Works:

Gentlemen:—The following statement exhibits the appropriations and disbursements, under the several heads, in the construction of the Water Works, to January 1, 1857:

Credits—		
Bonds, amount issued		$500,000 00
Interest and premiums on bonds	$17,696 76	
Less Commissions for negotiating bonds	4,448 08	
		13,248 68
Bills payable, given for materials, labor, etc		9,684 95
Coupons, not redeemed		105 00
		$523,038 63
Debits—		
Pipes and attachments, cost	$150,830 43	
Pipe laying, cost	50,857 49	
		$201,687 92
Engine house grounds, cost	$12,850 75	
Engine house, cost	69,105 50	
Engines, cost	85,798 95	
		$167,755 20
Reservoir grounds, cost	22,124 92	
Constructing reservoir, cost	59,464 96	
		$ 81,589 88
Aqueduct, cost as far as completed		35,548 65
Engineering, salary for engineers, etc		16,475 18
Incidental expenses, office expenses, damages, etc		4,094 01
Cash		15,887 83
		$523,038 63

Respectfully,

GEO. W. GIRTY, Secretary.

Office of the Water Works,
Cleveland, Feb. 9, 1857.

J.

To the Trustees of Water Works:

Gentlemen:—The following statement exhibits the amount of Water Leases, and also the amount of cash received on the Leases, together with amount received for the sale of Ferrules, to January 1, 1857:

1 Book Bindery and Store	$ 18 00
2 Livery Stables	112 00
2 Printing Offices	59 00
1 Carriage Manufactory	26 00
1 Confectionery Store	9 50
2 Stores and Dwellings	22 00
2 Provision Packing Houses	100 00
2 Rectifying Establishments	43 50
4 Grocery Stores with Rectifiers	63 00
9 Hotels	1,049 00
1 Foundry	74 76
4 Saloons	56 00
43 Dwellings	582 00
2 Bakeries	17 00
4 Offices	21 00
1 Machine Shop	17 00
1 Bath House and Barber Shop	50 00
4 Stores	24 00
5 Boarding Houses	142 00
1 Brewery	11 82
1 Malt House	3 24
1 Rail Road Co.	525 00
1 Gas Co.	128 64
Amount of annual rents	$3,454 46
Cash received for six months in advance	$1,727 23
115 Ferrules, each $3	345 00
Total receipts to January 1st, 1857	$2,072 23

GEO. W. GIRTY, Secretary.

Office of the Water Works,
Cleveland, Feb. 9, 1857.

RULES AND REGULATIONS

Adopted by the Board of Trustees of Water Works of the City of Cleveland, for the Introduction and Management of Service Pipes and the Payment of Rates.

---

1. No other person but the Superintendent and Engineer, or person employed by the Board of Trustees or employed by the said Superintendent and Engineer, will be permitted to tap or make any connection with the main or distributing pipes.

Any person who shall, without such authority, tap or bore any main or distributing pipe, is by law liable to a penalty not exceeding one hundred dollars, and costs of prosecution.

2. Application for a permit to connect the service or supply pipe with the main or distributing pipes, must be made to the Secretary, and the sum of three dollars paid in advance to cover the expense of the ferrule and inserting the same.

3. The material to be used in such service pipe shall be subject to the inspection of the Engineer and Superintendent, or their agent, and if found defective or of insufficient strength, the use of it will not be allowed. All connections shall be provided with a good and sufficient stop cock, which shall be covered by a box leading from the same to the surface of the earth, and covered with a cast iron cover with the letters "Water" thereon, and be exposed so as to be easily found, and the same shall be placed on the sidewalk within one foot of the line of the lot or the curbstone.

4. No plumber shall be permitted to enter pipe or conduct water into any two distinct premises, or tenements, unless separate and distinct stop cocks shall be placed on the outside of such premises, on the sidewalk, or in the alley opposite the same; and, also, an additional main stop on the sidewalk opposite the ferrule.

5. Persons taking water must keep their own service pipes and all fixtures connected therewith in good repair and protected from the frost, at their own expense, and must prevent all unnecessary waste of water.

6. No addition to, or alteration of any tap, pipe or water cock, shall be made except by plumbers duly licensed by the Board, and permission first had from the Secretary.

7. Hydrants, taps, water closets, baths, urinal, &c., will not be permitted to be kept running when not in actual use.

8. Applications for water must state fully all purposes for which it is required, and parties must answer without concealment all questions put to them, relating to its consumption.

9. Yard fountains or jets shall not be used longer than three hours each day, unless specially permitted and on additional pay-

ment, and the right is reserved to suspend their use whenever the public exigency may require it.

10. The Superintendent and Engineer, and other agents of the Board shall have free access at all reasonable hours to all parts of the premises where the water is delivered and consumed.

11. All Water Rents must be paid semi-annually in advance, at the office of the Trustees of the Water Works.

12. That on the refusal or neglect to pay the rent when due, or permitting any waste or use of the water not authorized by the Rules and Regulations of the Board of Trustees, the water shall be immediately turned off and not turned on again until all back rent and damages shall be paid, and the further sum of fifty cents for turning off and on the water, and when the ferrule has been withdrawn, an additional charge of three dollars for reinserting it.

WATER TARIFF.

Ordered, That the following rates for supplying Water, per year, shall be charged to consumers, payable semi-annually in advance, at the office of the Trustees of Water Works:

Dwelling Houses, not exceeding three rooms	$ 5 00
Each additional room up to sixteen	50
Over sixteen rooms, each	25
Bathing Tubs	2 00
Water Closets	2 00
Hotels, per room	1 00
Boarding Houses, per room	1 00
Bathing Houses, per tub	$5 00 to 10 00
Plugs for washing sidewalks and windows	2 00
Livery Stables, per stall, up to twenty stalls	2 00
Each additional stall	1 00
Private Stables, each horse kept	2 00
Bakeries, from	$5 00 to 10 00
Stores	5 00
Offices and Sleeping Rooms	$3 00 to 5 00
Churches, from	5 00 to 10 00
Schools, from	5 00 to 10 00
Cabinet and Carpenter Shops	5 00
Printing Offices	$5 00 to 10 00
Market Stalls	5 00
Markets	$5 00 to 20 00
Stone Yards	5 00
Blacksmith Shops, per fire	3 00
Steam Engines, per horse power	2 00
Steam apparatus for warming houses and other buildings, to be assessed.	
Colleges, Hospitals, Court Houses and Jails, to be assessed.	
Water to sprinkle streets, to be assessed.	
Distilleries and Rectifiers, Gas Works, Breweries and Malt Houses, Packing Houses, Slaughter Houses and Railroad, to be charged 1½ cents per bbl.	
Foundries and Machine Shops, 1½ cents per barrel.	
Plastering, for each 100 bushels of lime	$ 2 50
Wetting and grouting brick with mortar, per thousand	10
Private Fountains, to be assessed.	

September, 1856.

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ANNUAL REPORT

OF THE

TRUSTEES OF WATER WORKS,

TO THE

City Council of the City of Cleveland,

TOGETHER WITH THE

REPORTS

OF THE

SUPERINTENDENT AND ENGINEER, AND SECRETARY,

FOR THE YEAR ENDING DECEMBER 31, 1857.

PUBLISHED IN COMPLIANCE WITH THE ACT OF THE LEGISLATURE FOR THE GOVERNMENT OF THE CITY WATER WORKS.

CLEVELAND:
E. COWLES & CO., CITY PRINTERS, LEADER OFFICE.
1858.

(Cleveland)

M.W. Kingsley

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E.W.

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OFFICERS

OF THE

CITY WATER WORKS,

FOR 1858.

BOARD OF TRUSTEES.

H. B. PAYNE, *President*,
W. A. OTIS,
E. ROGERS.

SUPERINTENDENT AND ENGINEER,

JOSEPH SINGER.

SECRETARY,

GEO. W. GIRTY.

OFFICE,

No. 5 SUPERIOR STREET, UP STAIRS.

THE WATER RENTS,

on the rates of which a further reduction has been made lately, are due and payable at the office of the Water Works, semi-annually in advance; and the rates for the present year will be seen in the annexed Water Tariff.

Report of the Trustees.

To the Hon. Mayor and Common Council of Cleveland:

The Trustees of Water Works herewith submit the Annual Report of the Engineer and Superintendent, which exhibits the condition of the Works, and the operations in his department during the past year.

The accompanying abstract from the Secretary's books shows the receipts and expenditures during the year.

All of which is respectfully submitted.

H. B. PAYNE,
W. A. OTIS, *Trustees.*
E. ROGERS,

Office of Water Works,
Cleveland, Feb. 2d, 1858.

REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, Jan. 1st, 1858.

To the Trustees of Water Works:

Gentlemen:—In my first annual Report, of February 20th, 1857, upon the condition of the Works under your charge, it was stated, that some parts were unfinished, and estimates of expenditures for the necessary completion and protection were submitted to your consideration.

As the past season not all the proposed improvements could be made, on account of want of means, I must say, that for the safety of the Works, their originally intended completion should not be delayed much longer, and the necessary appropriations for the execution of these improvements to be provided for during this winter.

To give you a review of the Works and their present condition, I will adhere to the course of last year's Report; treating each part of the Works separately and in succession from the source of supply to the delivery of the water to the consumers.

Beginning with the

I. LAKE WORK AND AQUEDUCT.

I have to say: that early in the spring all preparations for laying the lake pipe and for finishing this important part of the Works, were completed, and the whole job would have been successfully finished, had it been possible to procure a suitable dredging machine to make the necessary excavation in the bottom of the Lake, preparatory to sinking the pipe to the proper depth.

The machine for making this excavation is now finished, and it is confidently expected to lay the Inlet-pipe at the first favorable opportunity.

In all other respects the Inlet remains in the same condition as at the time of last year's Report.

The additional experience of last year is still more convincing, that the tunnel through the Cleveland and Toledo Railroad should be kept open, and the construction of a permanent brick tunnel before restoring the Railroad embankment to its former condition, is again recommended.

It may also be well to remark, that the bracing and sheet-piling of this embankment was not intended to be used longer than about one year. It therefore may not be safe to let it remain in its present critical condition, as serious accidents may be apprehended by trusting to this temporary protection much longer.

The proposed back-filling over the Aqueduct south and south-east of the Railroad, was completed last summer, and the previous recommended drains put down. The good results of these improvements are already very visible, as the ground over the Aqueduct presents now an even and dry surface, and is covered with a luxuriant growth of grass.

The gate and gate-house on the east end of the Aqueduct and inside the Engine House lot, were built, and answer fully the intended purpose. The second one, on the western terminus of the Aqueduct, should be erected as soon as the lake pipe is laid.

II. ENGINE HOUSE.

The state of this building gives evidence of its substantial and durable character, as not the slightest settling of any part is perceptible.

The cracks in the stone-base of the chimney, reported last year, have not opened any farther, but still it is advisable to repair them according to the plan proposed.

Temporary coal-bins have been erected, opposite the boiler-rooms, each capable of holding 100 tons of coal. This capacity will suffice for a number of years; when they become too small and decayed, such new and substantial ones should be built, as have heretofore been recommended.

The grounds about the Engine House have not as yet been thoroughly graded, although something has been done towards it. A small additional expenditure applied to this purpose, and to trimming up the shore of the Old River Bed, would much improve this portion of the Works, which now has an unsightly and unfinished appearance.

III. PUMPING ENGINES.

It is satisfactory to report, that the Water Works machinery was never in better condition than at present, including all the apparatus throughout the whole system of supply.

The only repair on the engines for the past year consisted in renewing a broken trunion of the parallel motion on the pump-end of the west Engine. A stronger one was substituted. The same alteration was introduced into the other three remaining parallel motions of both Engines. The pumping machinery was thoroughly overhauled and repaired.

The diminution of the load on the Pump-plungers of 2000 lbs. each, evinces a considerable improvement in their working.

The following table shows the number af gallons of water pumped and distributed last year.

MONTH.	GALLONS PUMPED.		GALLONS DISTRIBUTED.		Galls. per day for each inhabitant.
	Per month.	Per day.	Per month.	Per day.	Gall. dec.
January	13,402,996	432,355	12,062,676	389,118	7.78
February	8,272,330	295,440	7,445,097	265,896	5.32
March	8,933,315	288,171	8,039,984	259,354	5.19
April	8,188,633	272,954	7,369,770	245,659	4.91
May	6,118,800	197,381	11,013,840	355,285	7.10
June	8,364,302	278,810	11,800,444	393,348	7.87
July	19,674,233	634,652	12,272,807	395,897	7.92
August	12,476,599	402,471	12,351,834	398,446	7.97
September	13,251,513	441,383	11,926,363	397,545	7.95
October	11,230,690	362,280	10,107,621	326,052	6.52
November	8,514,193	283,806	9,029,408	300,780	5.01
December	8,834,661	284,990	7,951,195	256,490	5.13
Total	127,262,265	347,891	121,371,039	331,989	6.55

The last column exhibits a small consumption compared with other cities; but taking into consideration the very limited patronage of the Water Works by the citizens, the consumption being confined to about one-twelfth of the whole population, who actually consumed 79.69 gallons per day for each individual—a quantity almost double of what is supposed to be a liberal allowance, was used.

The free and lavish use of water on the streets during the summer months, accounts for this excessive consumption of water.

The average daily duty of our Engines has been 37,500,000 lbs. of water raised one foot high, with 100 lbs. of coal consumed for raising steam and pumping.

This may be considered a very low duty for engines of this character, but due allowance should be made for the facts: that in the calculation of the above duty the last three months in the year are included, in which time slack only was used for fuel, and that the Engines have been running only between 3—4 hours per day. During the interval of stopping and starting, the furnace becomes each day comparatively cold, and therefore a large percentage of the fuel was consumed for re-heating the furnace and raising steam every morning. Connected with this loss, the boilers and steam-pipes of the Engines remain in part uncovered, which occasions considerable loss of heat by radiation, while the Engines are at work.

The Engines as yet have not been put to any trial for high duty. The time for pumping is too limited to make the desired test. It may be well to explain, that the advantage of high steam and principles and economy of expansion are not yet practiced with these Engines, as steam on the boilers does not exceed 22 lbs. to the inch, and continues from the first to be cut off in the cylinder at about half stroke.

This department of the Works does not come under the immediate control of the Superintendent and Engineer; it is merely incidental to it.

IV. RESERVOIR.

During the intense cold weather last winter the ice on the Reservoir obtained a thickness of over two feet, and its strong adhesion to the pavement of the inside slope caused, by the fluctuation of the water, the loosening of the brick lining, and subsequently the clay-puddle underneath was partly washed away. This was early in the spring thoroughly repaired, and it is hoped that the whole Reservoir is now perfectly solidified and in the best possible condition.

Early in the summer the appearance of the turf on the embankments indicated disease and decay, and the grass died on several spots. In a consultation on the subject with Mr. F. R. ELLIOT, nurseryman, this gentleman attributed the disease to the want of nutriment. By following implicitly his advice, the turf had in the fall already been restored to vigor and health. Continuing the recommended treatment during the winter and next spring, will effectually restore the grass to its original health and luxuriance.

The same treatment will have to be repeated at least three successive years to preserve the health and growth of the grass.

Upon the sound and safe condition of the Reservoir chiefly depends an uninterrupted supply of water, which is equally essential to the health and comfort of the citizens as to the safety of property and the general prosperity of the city.

The only incomplete feature of this important branch of the Works is the Waste-pipe, mentioned in last year's Report. The laying of this pipe should be effected as soon as the financial condition of the Water Works will permit.

In connection with the designated 20 inch Waste-pipe, the 8 inch pipe now laid from the Reservoir to Washington street should be extended to the Engine House, to be used as an auxiliary to indicate flood hight and escape of water at the Reservoir.

The cost would very soon be repaid in the saving of fuel, now lost; occasioned by the necessity of sending a person to ascertain and report this hight, a distance of half a mile up hill; as it often happens, that the Reservoir is found too full and the engine has to be stopped immediately and the fires withdrawn from the furnace, thereby wasting heat and fuel, which would be saved by introducing this auxiliary Waste-pipe.

A plan illustrative of this proposition will be submitted to your Board in due time, and its prominent advantages explained.

V. DISTRIBUTING PIPES.

The whole system of water-pipes is in good condition. A permanent protection to the River pipe was built last summer on the eastern shore of Cuyahoga river. It remains only to protect this pipe on the west side of the river in the same way.

During the past season only a very limited extension of pipe was made, and this with money advanced by interested parties, the Works having no means to make any extension whatever.

The annexed Schedule (A) gives the localities and lengths of pipes, laid last year, and the following table exhibits the total amount of Water-pipes laid in the city:

Diameter in inch.	24	20	16	10	8	6	4	3	2
Pipes laid previous to 1857,	2,668	10,564	2,608	5,205	6,421	15,704	25,636	1,737	23
Pipes laid in 1857							1,946	857	32
Total,	2,668	10,564	2,608	5,205	6,421	15,704	27,582	2,594	45
	15,840 feet.			54,912 feet.				2,639 feet.	

15,840 ft. = 3.0 miles of main pipes,
54,912 ft. =10.4 " distributing pipes, and
2,620 ft. = 0.5 " service pipes for fire hydrants and street cisterns.

73,391 ft. =13.9 miles in total.

To extend the benefits of the Works to all, making them truly "City Water Works," would not require the borrowing of any large amount at any one time.

Our machinery is capable of furnishing three times the present demand, at a mere nominal addition to the co-existent running expenses: $50,000 is estimated to be amply sufficient for completing and extending the Works in the coming year.

It is apparent, 1st, that the truest policy and the most economical course will be, to *extend* the Works, particularly on streets where a supply of water is most needed, and, 2d, that the money borrowed for this purpose, judiciously expended to furnish the most needy parts of the city with water, will prove no additional burden upon the citizens, as the revenue arising from the sale of water will be sufficient not only to pay the interest, ordinary repairs and other expenses, but to create a sinking fund that will redeem the original debt.

The comfort, protection, health and cleanliness arising from a bountiful supply of water equally diffused, commends the institution under your charge to the earnest *consideration* and *support* of the public.

By reason of there being so very few water-takers last winter, there was scarcely any circulation or current in the street pipes; (in some streets no water was taken at all;) much trouble and inconvenience was experienced during the intense cold weather. Some of the distributing pipes froze solid and consequently burst.

The table below gives a statement of all the breaks and leaks and their causes; all of which were promptly and properly repaired.

STREET.	Diam. Pipe in inch.					Total.	Cause of Leak.
	20	16	6	4	3		
Superior	1	..	..	..	..	1	Starting of lead in joint next to the River shore.
Vineyard	..	..	1	..	..	1	Burst of one pipe under the Railroad.
Euclid	..	..	1	..	..	1	Starting of wooden plug in branch pipe above the Square.
Superior	..	..	..	1	..	1	" " " " " west side "
"	2	..	..	..	..	2	Loosening of lead in joints, foot of Superior street.
West of Public Square,	..	..	..	1	1	2	Burst of two 4 inch and one 3 inch pipe by frost.
Euclid	..	..	4	..	1	5	Bursts of pipes on several places by frost.
Champlain	..	..	..	1	..	1	Next to Vineyard, flaw in pipe.
West River	3	..	..	..	..	3	Loosening of lead in joints on several places.
Lake	..	..	..	1	..	1	Burst of pipes by frost
Superior	..	..	..	1	..	1	" " " east of Public Square.
Lighthouse	..	..	..	1	..	1	Starting of lead joint.
Kinsman	..	..	3	..	..	3	Bursts of pipes by frost on several places.
Erie	..	1	..	..	..	1	Starting of wooden plug at the end of the pipe.
St. Clair	..	..	..	..	1	1	Burst of fire-plug pipe between Seneca and Ontario streets.
Ontario	..	..	..	..	1	1	Bursts of cistern pipe corner of St. Clair street.
Vineyard	..	..	1	..	..	1	Wood plug opposite James street blown out.
Seneca	..	..	..	1	..	1	Defect in pipe opposite Frankfort street.
Euclid	1	..	..	..	..	1	Starting of wooden plug at the end of the pipe.
River	..	..	..	1	..	1	Flaw in pipe next to Front street.
Kinsman	..	..	1	..	..	1	Defect in pipe above Eagle street.
West River	1	..	..	..	..	1	Loosening of lead in joint.
Total	8	1	11	8	4	32	

The repairs of the above breaks required:

50 feet of 6 inch pipe,	8—6 inch cleeves,
128 " 4 " "	5—4 " "
30 " 3 " "	3—3 " "

1 pair of 20 inch socket clamps, and 2 pair of 4 inch clamps.

At a recent inspection of the stop-valves, connected with the pipes, they were all found in good repair.

Schedule (B) is a complete list of them.

Thirty additional fire hydrants have been set up and connected with the water pipes, seven of the old ones, which were frozen last year, laid deeper, and the 3 inch pipe of one protected by a wooden box,

Schedule (C) gives the number and location of all fire hydrants now in use.

In addition to these fire hydrants, 43 street reservoirs are in e istence; 20 of them (marked in the annexed Schedule D thus *) a supplied with water from the Water Works by 3 inch pipes an brass cocks.

The hydrants are in good order, and whenever they have been i use, have worked well. Since the introduction of water into the cit its efficiency in subduing fires and checking their progress, has bee fully demonstrated and appreciated.

The numerous hydrants now in use under adequate head of wat afford great security against conflagrations.

The law which restricts the use of the fire hydrants to the office of the Works and the fire department in time of fire, should b *strictly* enforced; then all connected with this branch of the Wat Works would feel confident of finding the hydrants always in pe fect order in time of fire.

Under no circumstances should the use of the fire hydrants b permitted for any other purpose.

The establishment of a Pipe-yard is again recommended to you earnest consideration and strongly urged. The necessity for it an its usefulness are highly valued in other cities. From want of suitable place for storage of pipes, the Works are in as precarious situation now as last winter.

The annexed Schedule (F) shows the quantity of pipe on hand be very limited.

An accident, however trivial, may prove seriously disastrous, by any insufficiency or want of supply of water at fires, hydran may become useless, and by this casualty alone much damage ma ensue.

Schedule (E) gives the relative levels of the intersection streets above the established base and below the top water line the Reservoir. It also shows the quantity of water in gallons whic will pass through a five-eighth inch ferule per minute under the di ferent Reservoir-heads.

Inventories of all the materials, stock, tools and other implemen stored at different places, are given in the accompanying Schedul

It is gratifying that you have restored the use of the "pavemen plug" to its original purpose. The result will prove it [illegible] nomical for the Works to charge nothing for the use of this plug for washing windows and sidewalks, than to permit street-sprinkling at $2 per year.

To make our streets in summer time pleasant and comfortable, and relieve our citizens of that most disagreeable and unhealthy nuisance, the road dust, profuse sprinkling is absolutely necessary. To do this effectually, some system should be adopted whereby the sprinkling may be performed with regularity and dispatch, by means of either two inch hose and separate plugs, or by carts similar to those used in Boston and Cincinnati, which last mode would effectually prevent the sale of water for other than the intended purposes, by the teamsters employed for laying the dust on the streets.

To get an equivalent for the water so consumed and for manual labor or teams employed, would require an insignificant expenditure of money from the parties interested.

Perhaps the most simple and equitable way would be, to collect a very small amount per lineal foot from the land or property owners on streets so sprinkled; which proposition, I am satisfied, needs only to be submitted, and all our citizens will yield ready acquiescence to and aid in such a great promotion of their own comfort and welfare.

All of which is respectfully submitted.

JOSEPH SINGER,
Sup't and Engineer Cleveland Water Works.

SCHEDULE A.

Showing the Pipes laid during the year 1857.

Diam. of Pipe in inches.	In what Streets.	Between what Streets.	Feet laid.	Total.	Remarks.
4	Church,	Pearl and Hanover,	45		
4	River,	Lighthouse and Front,	40		
4	Meadow,	" "	283		
4	Sheriff,	Euclid and Prospect,	25		
4	Erie,	Kinsman and Parkman,	150		
4	Brownell,	Euclid and Prospect,	81		
4	Huntington,	Prospect and Garden,	50		
4	Burnham,	Kinsman and Scoville,	45		
4	Vine,	" "	45		
4	Granger,	Prospect and Garden,	36		
4	South Perry,	Kinsman and Scouille,	45		
4	Hudson,	Prospect and Euclid,	21		
4	Fountain Alley,	Ontario and Seneca,	44		
4	Johnson,	Bank and Water,	40		
4	Hamilton,	Erie and Muirson,	45		
4	St. Clair,	" "	110		
4	Frankfort,	Seneca and Bank,	44		
4	Oregon,	Erie and Muirson,	45		
4	West,	Vineyard and Merwin,	300		
4	Centre,	Summer and Merwin,	100		
4	Champlain,	Ontario and Seneca,	35		
4	Huron,	Prospect and Brownell,	154		
4	Bolivar,	" and Erie,	25		
4	Ohio,	Kinsman and Pittsburgh,	144		
				1952	
3	Pearl,	Corner of Franklin,	27		Fire hyd. connect.
3	Church,	" Pearl,	24		" " "
3	River,	" Front,	20		" " "
3	Meadow,	" "	29		" " "
3	Spring,	Lighthouse and St. Clair,	18		" " "
3	Seneca,	Corner of Noble Alley,	27		" " "
3	Seneca,	Corner of Superior,	28		" " "
3	Sheriff,	Corner of Prospect,	18		" " "
3	Erie,	Opposite Parkman,	18		Cistern connect'n.
3	Brownell,	South of Euclid,	8		" "
3	Huntington,	" Prospect,	10		" "
3	Burnham,	Corner of Kinsman,	24		Fire hyd. connect.
3	Vine,	" "	24		" " "
3	Granger,	" Prospect,	20		" " "
3	Perry,	" "	8		Cistern connect'n.
3	South Perry,	" Kinsman,	21		Fire hyd. connect.
3	Hudson,	" Prospect,	10		Cistern connect'n.
3	Lake,	" Bond,	36		Fire hyd. connect.
3	"	" Erie,	36		" " "
3	Fountain Alley,	" Ontario,	17		" " "

SCHEDULE A—CONTINUED.

Diam. of Pipe in inch.	In what Streets.	Between what Streets.	Feet laid.	Total.	Remarks.
3	Johnson,	Corner of Bank,	20		Fire hyd. connect.
3	Hamilton,	" Erie,	18		" " "
3	St. Clair,	Between Water and Bank,	39		" " "
3	"	" Ontario and Wood,	32		" " "
3	"	" Erie and Muirson,	16		Cistern connect'n.
3	Frankfort,	Corner of Seneca,	20		Fire hyd. connect.
3	Oregon,	" Erie,	25		" " "
3	Walnut,	" "	18		" " "
3	West,	" Vineyard,	12		" " "
3	Champlain,	" Ontario,	20		" " "
3	Prospect,	" High,	32		" " "
3	"	Between Oak and Erie,	18		" " "
3	"	" Erie and Brownell,	33		" " "
3	Huron,	East of Erie,	18		Cistern connect'n.
3	Boliver,	Corner of Prospect,	34		Fire hyd. connect.
3	Ohio,	Betw. Kinsman and Pittsburgh,	25		Cistern connect'n.
3	Kinsman,	Corner of Pittsburgh,	30		Fire hyd. connect.
3	"	Between Cross and Burnham,	25		" " "
				858	
2	Bank,	Corner of Superior,	22		
				22	For str't sprinkl'g.

SCHEDULE B.

Showing the Number and Location of Stop-Valves.

Number.	Water way in inches.	LOCATION.
1	24	In front of Engine House, (Pittsburgh Pattern, flanched.)
1	"	" " " Reservoir, 50 ft. east of Kentucky street.
1	"	" " " " for connection with 20 inch line.
3	24	INCH VALVES.
4	20	In the Reservoir.
1	"	In front of Reservoir, for east supply main.
1	"	" " " " " connection with 24 inch rising main.
1	"	North side of Franklin Place, between Ann and Hanover sts.
1	"	In Detroit street, east of Hanover street.
1	"	" " " south of Center street.
1	"	In West River street, opposite Superior street.
1	"	In Superior street, near the dock.
1	"	" " " on west line of Bank street.
1	"	In Euclid street, south-east corner of Public Square.
1	"	" " " west of Erie street.
14	20	INCH VALVES.
1	16	In front of Reservoir, for west supply main.
1	"	In Franklin street, west of Duane street, in the connection between the 20 inch and 16 inch mains.
1	"	In Erie street, on the north line of Euclid street.
1	"	" " " " " south " " " "
4	16	INCH VALVES.
1	10	In Prospect street, east of Sheriff street.
1	"	" " " on west line of Erie street.
1	"	" " " " east " " " "
1	"	" " " " " " " Brownell street.
1	"	" " " " " " " Cheshire "
1	"	" " " " centre of Perry street.
6	10	INCH VALVES.

SCHEDULE B—CONTINUED.

Number.	Water-way in inches.	LOCATION.
1	8	In Ontario street, on south line of Lake street.
1	“	“ “ “ “ north line of Rockwell street.
2	“	“ “ “ “ connections with 20 inch main.
1	“	“ “ “ opposite the Market House.
1	“	“ Prospect street, on east line of Ontario street.
1	“	“ Pittsburgh street, opposite Huron street.
1	“	“ “ “ on south line of Bolivar street.
8	8	INCH VALVES.
1	6	In Pearl street, on south line of Detroit street.
1	“	“ “ “ “ “ “ “ Franklin street.
1	“	“ Detroit “ “ east line of Pearl street.
1	“	“ Franklin street, on west line of Duane street.
1	“	“ “ “ “ “ “ “ Franklin Place, in the connection with the 16 inch main.
1	“	“ Franklin street, on west line of Pearl street.
1	“	“ “ “ “ east “ “ “ “
1	“	“ Vineyard street, on north line of Champlain street.
1	“	“ Superior street, on the connection of 6 inch line for Vineyard street with the 20 inch main.
1	“	“ Superior street, on the connection of 6 inch line for Water street with the 20 inch main.
1	“	“ Water street, on north line of Superior street.
1	“	“ “ “ “ south line of St. Clair street.
1	“	“ “ “ “ north “ “ “ “
1	“	“ “ “ “ “ “ “ Lake street.
1	“	“ Euclid street, on east line of Ontario street.
1	“	“ “ “ “ south-east corner of Public Square, in the connection with the 20 inch main.
1	“	“ Euclid street, center of Erie street, in the connection with the 20 inch main.
1	“	“ Euclid street, on the east line of Erie street.
1	“	“ “ “ “ “ “ “ “ Brownell street.
1	“	“ “ “ “ “ “ “ “ Huntington street.
1	“	“ “ “ “ center of Perry street.
1	“	“ Prospect street, between Perry and Hudson streets.
1	“	“ Kinsman street, on south line of Eagle street.
1	“	“ “ “ “ “ “ “ Ohio “
1	“	“ “ “ “ west line of Cross street.
1	“	“ “ “ between Cross and Burnham streets.
1	“	“ “ “ on east line of Burnham street.
1	“	“ “ “ “ west line of Harmon street.
[illegible]	[illegible]	[illegible] “ “ east line of Perry street.

SCHEDULE B—CONTINUED.

Number.	Water-way, in inches.	LOCATION.
1	4	In River street, on the south line of Front street.
1	"	" " " between Front and Lighthouse streets.
1	"	" " " in a right angle with south cor. of Lighthouse st.
1	"	" " " on north line of St. Clair street.
1	"	" " " " " " " Superior "
1	"	" Meadow street, on south line of Front street.
1	"	" " " " north line of Lighthouse street.
1	"	" Spring street, on south line of Lighthouse street.
1	"	" Vineyard street, on south line of West street.
1	"	" Bank street, on south line of Lake street.
1	"	" " " " north line of St. Clair street.
1	"	" " " " south " " " "
1	"	" " " " north line of Superior street.
1	"	" Seneca street, on south line of Lake street.
1	"	" " " " north line of St. Clair street.
1	"	" " " south " " " "
1	"	" " " " north " " Superior street.
1	"	" western street of Pub. Square, on south line of Superior st.
1	"	" Bond street, on north line of Superior street.
1	"	" Erie street, on south line of Lake street.
1	"	" " " " " " " West St. Clair street.
1	"	" " " center of Superior street, in the connection with the 16 inch main.
1	"	" Erie street, on south line of Superior street.
1	"	" " " " north line of Euclid street.
1	"	" " " " south line of Euclid street.
1	"	" " " " north line of Huron street.
1	"	" " " " south line of Huron street.
1	"	" " " " south line of Bolivar street.
1	"	" " " " south line of Eagle street.
1	"	" " " " north line of Kinsman street.
1	"	" Brownell street, on south line of Euclid street.
1	"	" Huntington street, on south line of Prospect street.
1	"	" Perry street, on south line of Euclid street.
1	"	" " " " north line of Prospect street.
1	"	" Lighthouse street, on east line of River street.
1	"	" " " " west line of Spring street.
1	"	" Lake street, on east line of Water street.
1	"	" " " " " " " Bank "
1	"	" " " " " " " Seneca "
1	"	" " " " " " " Ontario "
40		FORWARD.

SCHEDULE B—Continued.

Number.	Water-way in inches.	LOCATION.
40	4	BROUGHT FORWARD.
1	“	In Lake street, on east line of Wood street.
1	“	“ Lake street, on east line of Bond street.
1	“	“ Lake street, on east line of Erie street.
1	“	“ Fountain Alley, on west line of Ontario street.
1	“	“ St. Clair street, on east line of Water street.
1	“	“ St. Clair street, on west line of Bank street.
1	“	“ St. Clair street, on west line of Seneca street.
1	“	“ St. Clair street, on west line of Ontario street.
1	“	“ St. Clair street, on east line of Ontario street.
1	“	“ St. Clair street, on west line of Wood street.
1	“	“ St. Clair street, on west line of Bond street.
1	“	“ St. Clair street, on west line of Erie street.
1	“	“ St. Clair street, on east line of Erie street.
1	“	“ Rockwell street, on west line of Ontario street.
1	“	“ Rockwell street, on east line of Ontario street.
1	“	“ Rockwell street on west line of Wood street.
1	“	“ Rockwell street, on east line of Wood street.
1	“	“ Rockwell street, on west line of Bond street.
1	“	“ Rockwell street, on east line of Bond street.
1	“	“ Superior street, on east line of River street.
1	“	“ Superior street, on east line of Water street.
1	“	“ Superior st., opp. Bank st., in connection with 20 in. main.
1	“	“ Superior street, on east line of Bank street.
1	“	“ Superior street, opposite Seneca street, in the connection with the 20 inch main.
1	“	“ Superior street, on east line of Seneca street.
1	“	“ Superior street, on west line of Public Square.
1	“	“ Superior street, on east line of Ontario street.
1	“	“ Superior street, on east line of Wood street.
1	“	“ Superior street, on west line of Erie street.
1	“	“ southerly street of Pub. Square, on west line of Ontario st.
1	“	“ Walnut street, on east line of Erie street.
1	“	“ Chestnut street, on east line of Erie street.
1	“	“ Canal street, in front of Lucas' brewery.
1	“	“ West street, on west line of Vineyard street.
1	“	“ Center street, on east line of Merwin street.
1	“	“ Center street, on west line of Columbus street.
1	“	“ Center street, on east line of Columbus street.
1	“	“ Center street, on west line of Vineyard street.
1	“	“ Champlain street, on east line of Vineyard street.
1	“	“ Champlain street, on north line of Canal street.
80		FORWARD.

SCHEDULE B—Continued.

Number.	Water-way in inches.	LOCATION.
80	4	BROUGHT FORWARD.
1	"	In Huron street, on north line of Prospect street.
1	"	" Eagle street, on north line of Kinsman street.
1	"	" Eagle street, on west line of Erie street.
1	"	" Ohio street, on south line of Kinsman street.
84	4	inch Valves.
		RECAPITULATION.
3	24	inch Valves.
14	20	" "
4	16	" "
6	10	" "
8	8	" "
29	6	" "
84	4	" "
148		Valves in total.

SCHEDULE C.

Showing the Numbers and Location of Fire Hydrants.

Nbr.	In what Street.	Between what Streets.	Side of Street,
1	Pearl,	Church and Franklin,	East.
2	"	Corner of Franklin,	"
3	Church,	" Pearl,	North.
4	Franklin,	Kentucky and Duane,	South.
5	"	Duane and State,	"
6	"	Franklin Place and Pearl,	"
7	River,	Corner of Front,	East.
8	"	Front and Lighthouse,	"
9	"	Lighthouse and St. Clair,	"
10	Meadow,	Corner of Front,	"
11	Spring,	Lighthouse and St. Clair,	"
12	Vineyard,	Superior and Long,	West.
13	Water,	Lake and Johnson,	"
14	"	Corner of Frankfort,	East.
15	Seneca,	" Noble Alley,	"
16	"	" Superior,	"
17	Sheriff,	" Prospect,	West.
18	Erie,	Walnut and Chestnut,	"
19	"	Euclid and Prospect,	East.
20	"	Huron and Bolivar,	West.
21	"	Bolivar and Eagle,	East.
22	Burnham,	Corner of Kinsman,	West.
23	Vine,	" "	"
24	Granger,	" Prospect,	"
25	Perry,	" Kinsman,	East.
26	Hudson,	Head of Prospect,	"
27	Lighthouse,	River and Spring,	South.
28	Lake,	Bank and Seneca,	"
29	"	Seneca and Ontario,	North.
30	"	Corner of Bond,	South.
31	"	Bond and Erie,	North.
32	"	Corner of Erie,	South.
33	Fountain Alley,	" Ontario,	"
34	Johnson,	" Bank,	"
35	Hamilton,	" Erie,	"
36	St. Clair,	Water and Bank,	North.
37	"	Bank and Seneca,	South.
38	"	Seneca and Ontario,	North.
39	"	Ontario and Wood,	South.

SCHEDULE C—CONTINUED.

NBR.	IN WHAT STREETS.	BETWEEN WHAT STREET.	SIDE OF STREET.
40	St. Clair,	Wood and Bond,	North.
41	Frankfort,	Corner of Seneca,	”
42	Oregon,	Corner of Erie,	South.
43	Rockwell,	Ontario and Wood,	North.
44	Superior,	Water and Bank,	North.
45	”	Bank and Seneca,	South.
46	”	Opposite Wood,	”
47	”	Bond and Erie,	North.
48	Walnut,	Corner of Erie,	”
49	Euclid,	Sheriff and Erie,	”
50	”	” ”	South.
51	”	Muirson and Brownell,	North.
52	”	Dodge and Huntington,	”
53	”	Huntington and Perry,	South.
54	”	North Perry and Perry,	North.
55	Canal,	Champlain and Michigan,	South.
56	West,	Corner of Vineyard,	North.
57	Center,	Merwin and Columbus,	”
58	Champlain,	Corner of Ontario,	”
59	Prospect,	” High,	South.
60	”	Oak and Erie,	North.
61	”	Erie and Brownell,	”
62	”	Brownell and Huntington,	”
63	”	Opposite Cheshire,	”
64	”	Perry and Hudson,	South.
65	”	” ”	North.
66	Bolivar,	Corner of Prospect,	”
67	Eagle,	Kinsman and Erie,	South.
68	Kinsman,	Corner of Pittsburgh,	”
69	”	Ohio and Cross,	”
70	”	Cross and Burnham,	”
71	”	” ”	North.
72	”	Harmon and Perry,	”
73	Pittsburgh,	High and Huron,	East.
74	”	Huron and Bolivar,	”

SCHEDULE D.

Showing the Number and Location of the Street Reservoirs.

Nbr.	Street.	Location—Streets.	Nbr.	Street.	Location—Streets.
1	Kentucky,	Intersection of Clinton.	23	Huntington,	South of Prospect.*
2	Duane,	" "	24	Hudson,	Head of " *
3	State,	South of Detroit.	25	Liberty,	East of Pittsburgh.
4	"	Intersection of Ann.	26	Jackson,	West of Kinsman.
5	Hanover,	North of Church.	27	Mayflower,	" "
6	Pearl,	Intersection of Detroit.*	28	Lake,	Intersection of Wood.*
7	"	" Lorain.	29	Hamilton,	" Sterling.
8	"	" Willey.	30	St. Clair,	East of Erie.*
9	Columbus,	" Abbey.	31	Superior,	Intersection of Union.*
10	Franklin,	West of Franklin Place.*	32	"	West of Public Square.*
11	Bridge,	East of Fulton.	33	Euclid,	East of Erie.*
12	"	West of York.	34	Prospect,	" Ontario.*
13	Lorain,	" Jersey.	35	"	West of Perry.*
14	Water,	North of St. Clair.*	36	Huron,	East of Erie.*
15	Bank,	" Lake.*	37	Bolivar,	Intersection of 3d Alley.
16	"	" Superior.*	38	Ohio,	Between Pittsburgh and Kinsman.*
17	Ontario,	South of St. Clair.*			
18	"	North of Prospect.	39	"	West of Brownell.
19	Bond,	" Superior.*	40	Cedar,	Betw. Perry & Hudson.
20	Erie,	Opposite Parkman.*	41	Garden,	Intersection of Crocket.
21	Muirson,	South of Hamilton.	42	"	" Greenwood.
22	Brownell,	" Euclid.*	43	South Perry	" Orange.

* Reservoirs marked thus, are supplied by 3 inch pipe and cock.

SCHEDULE E.

Showing the relative Levels in feet and decimals of the Intersections of Streets above the established Base, and below top-water Line of the Reservoir; also the quantity of Water in gallons, which will pass through a 5-8 ferule per minute under the different Reservoir Heads.

INTERSECTION OF STREETS.	Above Base.	Below top water line	No. of gall'ns	INTERSECTION OF STREETS.	Above Base.	Below top water line	No. of gall'ns
Pearl and Detroit	95.29	59.66	8	Erie and Eagle	94.95	60.00	8
" Church	101.95	53.00	7	" Kinsman	100.07	54.88	7
" Franklin	110.51	44.44	5¾	Lake and Water	74.88	80.07	11
Franklin and Kentucky	111.20	43.75	5⅝	" Bank	72.48	82.47	11½
" Duane	117.34	37.61	4	" Seneca	72.11	82.84	11½
" State	120.91	34.04	3½	" Ontario	72.32	82.63	11½
" Franklin Place	116.74	38.21	4⅛	" Wood	72.74	82.21	11⅜
" Pearl	110.51	44.44	5¾	" Bond	71.90	83.05	11½
River and Front	1.47	153.48	20	" Erie	70.58	84.37	11⅝
" Lighthouse	3.75	151.20	19⅝	St. Clair and Water	75.03	79.92	11
" St. Clair	17.25	137.70	18⅜	" Bank	75.95	79.00	10¾
" Superior	18.40	136.55	18¼	" Seneca	76.18	78.77	10¾
Meadow and Front	2.13	152.82	19⅞	" Ontario	74.92	80.03	11
" Lighthouse	9.95	145.00	19	" Wood	74.95	80.00	11
Lighthouse and Spring	18.44	136.51	18¾	" Bond	74.31	80.64	11
Water and Lake	74.88	80.07	11	" Erie	73.95	81.00	11⅛
" St. Clair	75.03	79.92	11	Rockwell and Ontario	77.75	77.20	10½
" Superior	72.50	82.45	11½	" Wood	76.61	78.34	10¾
Vineyard and Superior	73.32	81.63	11¼	" Bond	74.81	80.14	11
" Long	63.62	91.33	12⅝	" Erie	74.91	80.04	11
" Champlain	25.51	129.44	17½	Superior and River	10.40	136.55	18¼
" West	14.41	140.54	18½	" Union	62.40	92.55	12¾
Bank and Lake	72.48	82.47	11½	" Water	72.50	82.45	11½
" St. Clair	75.95	79.00	10¾	" Vineyard	73.32	81.63	11¼
" Superior	81.88	73.07	9⅞	" Bank	81.88	73.07	9⅞
Seneca and Lake	72.11	82.84	11½	" Seneca	81.45	73.50	10
" St. Clair	76.18	78.77	10¾	" Ontario	81.25	73.70	10
" Superior	81.45	73.50	10	" Wood	78.65	76.30	10⅜
Ontario and Lake	72.32	82.63	11½	" Bond	76.60	78.35	10¾
" St. Clair	74 92	80.03	11	" Erie	75.50	79.45	10⅞
" Superior	81.25	73.70	10	Center and Merwin	3.90	151.05	19⅝
" Champlain	90.80	64.15	8⅝	" Summer	5 60	149.35	19½
" Michigan	93.10	61.85	8¼	" Columbus	7.30	147.65	19⅜
" Pittsburgh	91.24	63.71	8½	" Vineyard	13.40	141.55	18⅝
Pittsburgh and Huron	91.42	63.53	8½	Euclid and Public Square	90.40	64.55	8⅝
" Bolivar	92.12	62.83	8⅜	" Sheriff	88.83	66.12	8⅞
" Kinsman	91.03	63.92	8½	" Erie	86.95	68.00	9⅛
Kinsman and Eagle	91.03	63.92	8½	" Muirson	87.54	67.41	9
" Ohio	94.47	60.48	8	" Brownell	86.74	68.21	9⅛
" Erie	100.07	54.88	7	" Huntington	86.38	68.65	9¼
" Burnham	102.47	52.48	6¾	" Perry	88.02	66.33	8⅞
" Vine	102.27	52.68	6¾	Prospect and Ontario	93.15	61.80	8¼
" Harmon	101.73	53.22	6⅞	" Sheriff	94.33	60.62	8
" Perry	101.73	53.22	6⅞	" Erie	94.05	60.90	8
Erie and Lake	70.58	84.37	11⅝	" Brownell	94.88	60.07	8
" St. Clair	73.95	81.00	11⅛	" Huntington	94.61	60.34	8
" Superior	75.50	79.45	10⅞	" Cheshire	94.99	59.96	8
" Euclid	86.95	68.00	9⅛	" Granger	95.42	59.53	8
" Prospect	94.05	60.90	8⅛	" Perry	93.95	61.00	8⅛
" Bolivar	95.36	59.59	8	" Hudson	93.95	61.00	8⅛

SCHEDULE F.

Statement of Pipes and Attachments on hand.

		FEET	
2	Whole 20 inch pipe, - - -	18	
7	Pieces 20 " " together,	30	6
	Total of 20 inch pipe, -	48	6
1	Whole 16 inch pipe, - - -	9	
5	Pieces 16 " " together,	23	4
	Total of 16 inch pipe, -	32	4

7 Pieces of 4 in. pipe, together, 35.7 ft.
4 " 3 " " 22.5
1 8 inch 2 way branch pipe,
5 6 " 2 " " "
13 4 " 2 " " "
2 10 " 1 " " "
2 8 " 1 " " "
5 6 " 1 " " "
1 4 " 1 " " "
1 reducing pipe from 36 inch to 24 inch,
1 " " " 24 " 20 "
2 " " " 16 " 10 "
3 " " " 10 " 6 "
1 " " " 10 " 4 "
1 " " " 8 " 4 "
8 " " " 8 " 3 "
3 " " " 6 " 3 "
12 " " " 4 " 3 "
2 6 inch Y pipes,
4 4 " Y "
2 20 " curves,
7 10 " "
6 8 " "
4 6 " "
12 4 " "
4 3 " "
1 24 " sleeve,
1 20 " "
1 16 " "
4 10 " "
6 4 " "
1 3 " "
4 pair of 6 inch socket clamps,
1 " 4 " " "
2 " 24 " wrought "

		FEET	
7	Whole 8 inch pipes, - - -	63	
4	Pieces 8 " " together,	22	75
	Total of 8 inch pipe, -	85	75
3	Whole 6 inch pipes, - - -	27	
6	Pieces 6 " " together,	25	75
1	Whole extra strong 6 inch pipe,	9	
	Total of 6 inch pipe, -	61	75

3 pair of 24 inch clamps,
2½ " 8 " "
½ " 6 " "
1 " 4 " "
1 24 inch valve,
2 20 " "
2 10 " "
2 8 " "
18 6 " "
2 4 " "
71 valve box covers and frames,
2 8 inch drain valves for Reservoir,
2 valve stands for same,
1 8 inch pipe for testing valves,
1 8 " stand pipe, 17.6 feet long,
2 flanched 4 inch pipes,
1 flexible 6 inch pipe, 16 feet long,
2 wrenches for same,
Hydrant numbers from 414 to 500,
24 hydrant letters,
4 1 inch ferules,
25 ¾ " "
57 ⅝ " "
6 sections 2 inch rubber hose,
2 reducing hose, from 3—2 inch,
2 hose pipes,
3 nozzles for sprinkling streets,
1 hose cart,
2 hose wrenches,
1 reducing hose, from 3—1½ inch,
1 fire hydrant, complete,
2 3 inch stopcocks,
2 2 " "
1 pipe press,
1 lot of gaskets for testing pipes.

SCHEDULE G.

Showing the Fuel, Tools, &c., at Engine House and Grounds.

150 tons of Brier Hill Slack,
30 gall. of Lubricating Oil,
¾ " Linseed Oil,
¼ " Oil of Turpentine,
150 lbs. of Beef Tallow,
17 " Mutton Tallow,
6 " White Lead,
12 " Red "
½ " Black "
450 " Cotton Waste,
70 " Hemp Packing,
½ quire Emery Cloth,
½ lb. of Flour of Emery,
1 Bath Brick,
1 Tallow Kettle,
6 brass Oil Cans,
2 tin " "
3 globe Lanterns,
3 brass Hand Lamps,
2 tin " "
2 Brooms,
2 Dusting Brushes,
1 Mop Handle,
3 Pails,
1 tin Dipper,
5 lengths of Leather Hose,
2 copper Hose Pipes,
1 " Nozzle for same,
2 brass " "
1 Sprinkling Rose,
1 Grindstone,
2 Finisher Benches,
1 Carpenter Bench,
2 Bench Vices,
20 Files,
6 File Handles,
26 Cold Chisels,
20 Drills,
2 small sets of Stocks,
1 large set of "
8 sets of Dies,
14 " Taps,
6 Tap Wrenches,
2 Screw "
5 Socket "
24 Common "
3 Copper Hammers,
1 small Riveting Hammer,
2 Sledges,
1 Hack Saw,
2 " Frames,
1 Ratchet Drill Brace,
1 Hand Brace,
9 Bits,
1 Hand Vice,
2 Screw Drivers,
1 Jack Plane,
2 Carpenter Chisels,
2 Gouge Chisels,
1 Oil Stone,
1 Hand Saw,
1 Hand Axe,
1 pair of large Compasses,
1 set of Figures,
2 tin Watering Pots,
1 large Knife,
4 Packing Hooks,
2 Packing Worms,
7 iron Settees,
1 Folding Lounge and Bedding,
1 Table,
2 Arm Chairs,
1 Chair Cushion,
1 Inkstand and 3 Record Books,
170 feet of 6 inch Rope,
203 feet of 4½ inch Rope.

SCHEDULE G—CONTINUED.

135 feet of 3½ inch Rope,
110 feet of 3 "
250 feet of Lashing,
2 sets of 13 inch Blocks,
1 " 9 "
1 " 8 "
1 Screw Brack't for Pump-valv's
2 Stoves,
2 Coal Scuttles,
2 Shovels,
2 Pockers,
1 Dust Pan,
1 Platform Scale,
1 Fire Shovel,
1 Coal "
1 Coal Wheelbarrow,
1 set of Fire Irons,
2 pair of Blacksmith Bellows,
1 portable Forge,
7 pair of Tongs,
2 Anvils,
2 sets of Swedges,
1 Set-hammer,
3 Sledges,
1 Cold-set,
1 Fuller,
20 bbls. of Water Lime,
2 Hand Trucks,
1 bar 1¼ inch Iron,
1 Hand Pump,
1 Crowbar,
5 Boiler Grate Bars,
1 Scythe,
100 Fire Bricks,
4 Water-casks and 1 Barrel,
1 Stove, at the Lake,
2 Scoops,
1 Sledge,
1 Hand Hammer,
1 Crowbar,
1 Pick,
2 Rakes,
1 Broom,
1 Pail,
1 Dipper,
2 pair of Rubber Boots,
1 tin Lantern,
1 Ladder at Reservoir,
1 Tool-box "
8 Calking Tools,
1 Marking Iron—C. W. W.
240 lbs. of Bolts and Nuts,
1 Thermometer,
1 Worthington Pumping Engine
1 four-horse power Engine and Chain Pump,
1 Stove Brush and Blacking,
4 Needles and ½ skein of Sail Twine,
1½ bar of Soap,
¼ yard of Flannel,
2 skeins of Lampwick,
1 lot old Lumber,
11 feet of Stand Pipe.

SCHEDULE H.

List of Tools for Pipe Layers and Street Men.

35 Picks.
8 new Shovels.
22 old "
2 Sledges.
12 Calking Tools.
4 Hemp Chisels.
19 Cold Chisels.
5 Calking Hammers.
7 Clay Boards.
3 Clay Pails.
7 Axes and 1 Hatchet.
1 Bucksaw and 2 Sawbucks.
1 Wheelbarrow.
2 Furnaces.
2 Kettles for melting lead.
7 Ladles.
1 Pipelayer's Line.
5 Hand Tool Boxes.
4 large Tool Boxes.
1½ Coil of Hemp-packing.
4 Hand Rams.
8 common Wrenches.
4 Crowbars.
1 Handspike.
2 8 inch Plugs.
3 6 inch "
1 tin Pump.
2 Pump Handles.
7 pieces 1 in. Rope diff. lengths.
1 lot wrought Spikes and Bolts for clamps.
½-keg Nails.

1 set 20 inch Clamps, complete
6 set 10 inch " "
4 set 8 inch " "
1 set 6 inch " "
7 set 4 inch " "
2½ pair 8 inch Bands.
15 pair 6 inch "
2 10 inch Crossbars.
5 4 inch "
3 10 inch Clamp Bolts.
14 6 inch " "
2 4 inch " "
14 Hammer Handles.
4 4 inch Washers.
2 Pawl Drills.
2 Drilling Hooks.
12 Drills.
4 Rimmers.
12 Street Wrenches.
1 Tap Line.
1 Valve Box Scraper.
1 Fire Hydrant Wrench.
46 ¾ inch Washers.
79 ⅝ inch "
2 Screw Wrenches.
2 iron Rimmer Handles.
½ side Lace Leather.
1 Gauge for lead pipe.
2 Files.
1 20 inch wrought Clamp.
10 feet Rubber & 16 feet Leather Belt.

SCHEDULE I.

Office Furniture, Stationery, &c.

2 Writing Desks.
1 Bureau for drawings.
1 round Table.
2 Drawing Tables.
1 cushioned Chair.
6 can seat Chairs.
2 Stoves and Stovepipes,.
1 copper Kettle for stove.
1 Coal Shovel.
1 Pocker.
2 Coal Scuttles.
1 Letterpress and Stand.
1 Picture, gold frame and glass.
1 Clock.
2 Marking Irons—C. W. W.
1 Pitcher.
2 Tumblers.
1 Globe Lantern.
1 lot Rubber Gaskets, for fire hydrants.
1 tin Gallon Measure.
2 Feather Duster.

3 Drawing Boards.
2 Curve Rules.
1 Parallel Rule.
2 Drawing Scales.
3 Inkstands.
1 Level, Tripod and Rod.
6 Center Rods.
1 Chain, 100 feet long.
24 lbs. of Drawing Paper.
2 doz. Drawing Pencils.
3 yards Tracing Cloth.
A full complement of Plans, Maps and Sketches for Water Works.
A quantity of printed Specifications.
2 Sprinkling Pots.
1 Mop Handle.
5 new Brooms.
3 used ”
¼ box of Bar Soap.
1 Tin Box for drawings.
1 Hand Broom.

The list of Tools, Stock and Patterns at the Work Shop, remain the same, as shown in Schedule "E" of last year's Report.

Report of the Secretary.

To the Trustees of City Water Works:

Gentlemen:—The following is an exhibit of the Construction Fund Books on the 1st January, 1858:

Credits.

Bonds, issued	$500,000.00
Bills Payable, Note to P. Munks	550.00
Interest and Premiums, on Bonds	15,214.54
Coupons, not redeemed	17,543.75
H. G. Lucas & Co., for pipe laid	545.53
Jno. B. Smith & Co., do.	310.96
Cleveland Gas Company, do.	305.11
I. S. Converse, do.	233.59
J. M. Hughes, do.	210.84
Robt. Larnder, do.	84.62
	$534,998.94

Debits.

Duncan, Sherman & Co., to redeem Coupons	$17,522.32
Cash on hand	809.71
Engineering, amount paid	16,475.14
Incidental Expenses—Office Expenses and Damages	4,094.01
City of Cleveland, for Fire Hydrant Connections	513.41
Reservoir—cost of Construction	81,589.88
Henry Chisholm, on account of Inlet-pipe work	300.00
Running Expenses—am't loaned for running the works	6,142.22
Aqueduct—amount thus far expended	36,939.76
Pipe and Pipe Laying—cost of pipes and laying same	201,689.92
Pipe Extension—for amount expended in 1857	684.70
Engine House and Engines—for amount of cost	168,239.87
	$534,998.94

DISBURSEMENTS,

On Account "Running Expenses" of Cleveland Water Works for 1857.

Jan'y 6.	To Smith, Dodd & Co.'s bill	$12.00	
	Jno. Burk's bill	6.75	
19.	Cleveland Oil Co.'s bill	82.27	
	T. R. Scowden's bill	204.34	305.36
Feb'y 2.	Pay Roll	611.02	
16.	Eddy & Co.'s	1.00	
	Pay Roll	14.00	626.02
March 2.	T. H. Eddy & Co.'s acc't	5.88	
	Pay Roll	667.66	
31.	Outhwaite & Blackwell's bill	2.50	676.04
April 6.	Pay Roll	676.49	
20.	Taulman, Lowe & Co.'s bill	11.63	
	V. Swain's bill	1.27	
	E. W. Sackrider's bill	6.25	695.64
May 4.	Pay Roll	682.99	
18.	Cleveland Oil Co.'s bill	31.86	714.85
June 1.	Pat. Munks' bill	24.00	
	Pay Roll	713.49	
8.	Cuya. Steam Furnace Co.'s bill	2.13	
22.	Jno. Rockafellow's bill	27.00	
	Parish & Knight	184.50	
	Gaylord & Hammond	3.98	
	Paid for Ferules	12.70	967.80
July 1.	Pay Roll	694.12	
	J. B. Barnes & Co	9.50	
	Pat. Munks	52.00	
	W. F. Newcomb's bill	15.00	
	Cleveland Oil Co.	41.50	
13.	Silas Merchant's acc't	22.32	
20.	Pay Roll	18.38	
29.	Outhwaite & Blackwell's bill	8.70	861.52
Aug't 2.	Pay Roll	695.66	
	Pat. Munks' bill	54.00	
10.	Perry, Cross & Co.'s bill	531.93	
	Taulman, Lowe & Co.'s bill	49.25	
	Hauling Coal	16.40	1,347.24
Sept. 1.	Cleveland Oil Co.'s bill	34.04	
	Pat. Munks' bill	52.00	
	Sundries paid for by Girty	10.04	
	Jos. Singer's bill—Sundries	20.74	
	Jno. Drumm's bill	2.88	
	Pay Roll	694.74	
13.	Harris & Fairbanks' bill	8.00	
	C. Prentiss' Coal bill	26.25	
	Outhwaite & Blackwell's bill	2.50	

29.	Tod, Yates & Taylor's Coal bill	333.10	
	Walter Farnan's acc't	61.40	
30.	Pay Roll	700.11	
	Pat. Munks' bill	77.00	2,017.80
Oct. 12.	Sanford & Hayward's acc't	31.65	
	Jno. English's bill	28.72	
	O. H. Perry's bill	98.54	
	Michl. Pattinson	8.05	
	Outhwaite & Blackwell	2.50	
19.	E. W. Sackrider's bill	3.00	
	Michl. Imhof	11.70	184.16
Nov. 2.	Pay Roll	723.74	
9.	Woodward & Logan's bill	1.44	
	G. W. Berry's bill	4.50	
16.	Perry, Cross & Co.'s bill	267.12	
	Schultz & Bros.	18.00	
	Cleveland Oil Co.'s bill	83.82	
20.	E. W. Sackrider	3.00	
	Everett & Co.'s bill	28.75	1,130.37
Dec'r 1.	Pay Roll for November	443.57	
28.	Sanford & Hayward's acc't	7.00	
	Seaman & Smith's acc't	10.00	
31.	Pay Roll for December	421.66	
	Gaylord & Hammond's acc't	4.21	
	A. G. Searls' bill	12.21	
	Harmon & Crowl	2.69	
	W. Bingham & Co.	41.02	
	O. H. Perry's bill	125.00	
	Sanford & Hayward	117.10	
	Jos. Singer, sundries	20.63	
	P. Bradley, for damages	2.00	
	Mrs. A. Semple, "	5.00	
	L. Semple, "	20.00	
	H. B. Payne, expenses to N. Y.	19.00	
	Incidental expenses	67.47	
		$1,319.12	
	Collected from City	30.25	1,288.87
	Total amount expended in 1857,		$10,815.67

DISBURSEMENTS

On Account of "Repairs" of Cleveland Water Works for 1857.

March 2.	To Watching	4.00	
	Pay Roll	29.64	
12.	do.	50.40	
31.	I. K. Bishop, bill for Screens	60.00	
	Pay Roll	28.50	172.54

April 6.	Pay Roll	44.38	
20.	Outhwaite & Blackwell's bill	3.70	48.08
May 25.	J. B. Barnes' bill	5.55	5.55
June 1.	Pay Roll	79.88	
8.	Cuyahoga Steam Furnace Co.	738.88	
15.	M. O'Neill's bill, hauling	14.00	
22.	Wm. Mails' bill, bricks	95.10	
	Pay Roll	271.58	1,199.44
July 1.	do.	11.25	
	W. F. Newcomb's bill	1.50	12.75
Aug. 10.	John English's bill	5.63	5.63
Sept. 1.	Murray, Prior & Co.'s bill	5.87	
	John English's bill	4.50	
	Jno. Drumm's bill acc't	4.15	
13.	Silas Merchant's acc't	64.62	
	Southworth & Scott's bill	1.75	
29.	Ch. P. Born's acc't	13.30	
	Pay Roll	29.92	124.11
Oct. 12.	A. G. Searls' bill	6.50	6.50
Nov'r 2.	Wm. Lange's bill	1.25	1.25
Dec. 7.	C. C. Nott's bill	4.00	
28.	Pay Roll	13.68	
	Th. Manning's bill	4.25	
	Wm. Bingham & Co.'s bill	89.79	
	Repair on Reservoir	210.49	322.21
			$1,898.06
	Collected from several parties		9.83
	Total amount expended in 1857,		$1,888.23

CASH RECEIVED

For Water in 1857 *on account Cleveland Water Works.*

January,	Water-Rents,	$102.75
February,	"	121.75
March,	"	234.44
April,	"	909.31
May,	"	2,154.71
June,	"	1,251.69
July,	"	469.80
August,	"	304.75
September,	"	370.43
October,	"	888.68
November,	"	1,051.87
December,	"	924.05
	Total amount received in 1857	$8,784.23

RECAPITULATION.

Cash on hand, as per statement, Jan. 1, 1857,		$15,887.83
Cash rec'd from the City in 1857, for interest and coupons,		1,965.86
Cash rec'd from individuals for pipe laid		1,690.65
		$19,544.34
1857. Paid as follows:		
On account Aqueduct	$1.391.11	
On " Engine House and Engines	484.67	
Henry Chisholm	300.00	
On account City of Cleveland	513.41	
Extending Water-pipes	684.70	
Duncan, Sherman & Co.	83.57	
Bills payable	9,134.95	$12,592.41
Jan. 1st, 1858. Balance		$6,951.93
Cash on hand	$809.71	
Cash loaned, running account for Expenses,	6,142.22	$6,951.93

Running Expenses in 1857	$10,815.67
Repairs in 1857	1,888.23
	$12,703.90
Receipts for Water in 1857	8,784.53
Expenses more than Receipts for 1857	$3,919.67
Total Expenditures on account Cleveland Water Works, from Oct. 1st, 1856 to Jan. 1st, 1858, Running Expenses	$14,616.96
Repairs	1.888.23
	$16,505.19
Total Receipts for Water from October 1st, 1856, to January 1st, 1858	10,856.46
Expenditures more than Receipts from the commencement to the present time	$5.648.73

All which is respectfully submitted.

GEO. W. GIRTY, Secretary.

CLEVELAND, January 1st, 1858.

CLEVELAND WATER WORKS.

WATER TARIFF FOR 1858.

ORDERED, That the following Rates for supplying Water, per year, shall be charged to consumers, payable semi-annually in advance, at the Office of the Trustees of Water Works:

Dwelling Houses, not exceeding five rooms.	$ 5 00
Each additional room,	50
(Including use of plug and water closet.)	
Bathing Tubs, each	2 00
Water Closets,	$2 00 to 5 00
Hotels, per room,	1 00
Boarding Houses, per room,	1 00
Bathing Houses, per tub,	5 00 to 10 00
Saloons and Eating Houses,	5 00 to 25 00
Livery Stables, per stall up to ten stalls,	2 00
Each additional stall,	1 00
Private Stables,	2 00
Bakeries,	5 00 to 10 00
Stores, with or without plugs,	5 00
Offices and Sleeping rooms,	2 00 to 5 00
Churches,	5 00 to 10 00
Schools,	5 00 to 10 00
Cabinet and Carpenter Shops,	5 00
Printing Offices,	5 00 to 10 00
Market Stalls,	3 00
Markets,	5 00 to 20 00
Stone Yards,	5 00
Blacksmith Shops, per fire,	2 00
Steam Engines, per horse power,	2 00
Steam apparatus for warming houses and other buildings to be assessed.	
Colleges, Hospitals, Court Houses and Jails, to be assessed.	
Water to sprinkle streets, to be assessed.	
Distilleries and Rectifieries, Gas Works, Breweries and Malt Houses, Packing Houses, Slaughter Houses and Railroads, to be charged	1½ cts. per bbl.
Founderies and Machine Shops,	1½ cts. per bbl.
Building purposes—100 bushels lime,	$2 00
Stone, per perch,	2
Brick, per thousand,	5
Private Fountains,	$ 5 00 to $25 00

December 1st, 1857.

RULES RELATING TO PLUMBERS.

1. No person shall make any attachment or connection with the pipes of the Water Works, unless licensed as a Plumber by the Board of Trustees.

2. Any Plumber, wishing to do business in connection with the Water Works, shall, before receiving any permit to do so, file in the office of Water Works, his petition in writing; giving the name of the firm and place of business, asking to become a Plumber in connection with said works; stating his willingness and consent to be governed in all respects by the by-laws, rules and regulations of said works, passed by the Board of Trustees or the City Council; and every Plumber shall be subject and conform to, all and singular, the rules, regulations, penalties and conditions, which exist now or may be hereafter passed by said Board of Trustees or the City Council.

3. Every attachment or connection with the pipes of the Water Works shall be made in the presence of the Superintendent and to his satisfaction, at the expense of the applicant, for which a Permit shall have been previously obtained from the Secretary. The application for such Permit must be made by the Plumber, and the sum of three dollars paid by the applicant in advance, to cover the expense of the ferule and inserting the same, and the number of the Permit.

4. No Plumber shall be permitted to enter pipe or conduct water into any two distinct premises, or tenements, unless separate and distinct stop-cocks shall be placed on the outside of such premises, on the side-walk, or in the alley opposite the same, and also an additional main-stop on the side-walk opposite the ferule, as the Engineer and Superintendent directs.

5. All connections shall be provided with a good and sufficient stop-cock, which shall be covered with a box, leading from the same to the surface of the earth, and covered with a cast-iron cover with the letters "Water" thereon, and be exposed so as to be easily found,

and the same shall be placed on the side-walk, within one foot of the line of the curb-stone.

The number of the permit to be riveted to the cover of the stop-cock box, and in cases where two or more distinct premises are supplied from the same pipe, the number to be attached to the cover of the main stop opposite the ferule.

The separate stop-cocks for the several tenements to be marked with letters, and an additional charge of twenty-five cents has to be paid for each letter so issued.

6. All stop-cocks used for service-pipes of one inch bore and less, to be provided with a Tee handle (T) not less than 7-16 in. and not more than 5-8 in. in width across the Tee.

The stop-cocks used for service-pipes above one inch water-way to 2½ inches, to have a square top to the key measuring 1 3-8 in. on each side of the square.

Three-inch stop-cocks to have an oblong top 3¼ in. long by 1¼ in. wide.

7. The opening of the covers to be 4 inches square for all service-cocks of less than 3 inches water-way, and for 3 inch cocks to be large enough to admit a fork-wrench 4¾ in. long and 1 5-8 in. wide.

8. In cases where the stop-cock has to be placed deeper than 6 feet, a stationary wrench, which comes up to the ordinary depth of the cocks, has to be put on, and the top of this wrench to be of the same dimensions as the top of the handle of the cock.

9. The material to be used for service-pipes between the ferule and the stop-cock on the side-walk, shall in each and every case be subject to the inspection of the Engineer and Superintendent or their agent, and if found defective or below the standard established by the Trustees, the use of it will not be allowed, and no tap will be made until such defective pipe is removed and faultless pipe substituted.

The following weight per lineal foot of lead-pipe is the standard for service-pipe established by the Trustees.

Lead-pipe	⅜	inch	bore,	2 lbs.	per	lineal foot.
"	½	"	"	2 lbs. 7 oz.	"	"
"	⅝	"	"	3 lbs.	"	"
"	¾	"	"	3 lbs. 10 oz.	"	"
"	1	"	"	4 lbs. 12 oz.	"	"
"	1¼	"	"	6 lbs.	"	"
"	1½	"	"	7 lbs. 2 oz.	"	"
"	1¾	"	"	8 lbs. 4 oz.	"	"
"	2	"	"	9 lbs. 8 oz.	"	"

On all service-pipes wiped joint to be made without any exception.

10. In all cases, where boilers are supplied, a suitable safety or check-valve must be applied, to prevent damage by collapsing or otherwise, when the water is shut off from the street-main.

11. Within forty-eight hours after completing any attachment or connection, the Plumber shall make a true return in writing on the back of the permit, of the number of rooms in the premises, or other contemplated use of the water therein, according to the Tariff of Water Rents, and file the same in the office of the Secretary.

This return shall also state accurate and complete measurements of the distance, north, south, east or west from the corner of the nearest street, lane or alley, from which the stop-cock is placed; the measurement to be made in direct line with the face or front of the house or fence, on the corner, and further the name of the street, lane or alley containing the pipe into which such entry has been made, and whether the stop-cock is on the north, south, east or west side of the same. Every return must be full and complete in every particular.

12. No addition to, or alteration of any tap, pipe, cock or other fixtures attached to the Water Works shall be made, except by special permission first obtained from the Secretary, and the Plumber shall report each change in a concise manner to the Secretary of the Water Works in writing, within ten days thereafter.

13. Plumbers making repairs to hydrants or other fixtures attached to the Water Works in cases where the water has been shut off on account of leaks or other defects, shall give the owner or occupant of the premises a written certificate that such fixtures have been properly repaired; otherwise the water shall not again be let on.

14. No Plumber shall, after making any connection with the street-mains, or after making repairs, or putting in any new attachments, leave the stop-cock open and the water on the premises, under the penalty of ten dollars for every case, and shall be liable to all damages accruing from the violation of this rule.

15. Every Plumber failing to make a return as aforesaid, or failing in any case to return the whole number of rooms or other contemplated uses of water, or using service-pipe between the main or distributing pipe and the stop-cock, below the standard established by the Board of Trustees, shall forfeit his license as Plumber, and be subject to a penalty not exceeding fifty dollars.

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ANNUAL REPORT

OF THE

TRUSTEES OF WATER WORKS,

TO THE

City Council of the City of Cleveland,

TOGETHER WITH THE

REPORTS

OF THE

SUPERINTENDENT AND ENGINEER, AND SECRETARY,

FOR THE YEAR ENDING DECEMBER 31, 1858.

PUBLISHED IN COMPLIANCE WITH THE ACT OF THE LEGISLATURE FOR THE
GOVERNMENT OF THE CITY WATER WORKS.

CLEVELAND:
FAIRBANKS, BENEDICT & CO., CITY PRINTERS, HERALD OFFICE.
1859.

M.W. Kingsley

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NTERS, HERALD OFFICE.

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OFFICERS OF THE CITY WATER WORKS,

FOR 1859.

BOARD OF TRUSTEES,

W. A. OTIS, PRESIDENT,
S. F. LESTER,
W. B. CASTLE.

SUPERINTENDENT AND ENGINEER,

JOSEPH SINGER.

SECRETARY,

GEO. W. GIRTY.

OFFICE:

COUNCIL HALL BUILDING, SOUTH SIDE OF PUBLIC SQUARE.

The Water Rents

Are due and payable at the Office of the Water Works, semi-annually in advance; and the rates for the present year will be seen in the annexed Water Tariff.

All leases for water shall be for the term of one year.

REPORT

OF THE

Trustees of Water Works.

To the Hon. Mayor and Common Council
of the City of Cleveland:

The Trustees of Water Works herewith submit the annual Report of the Superintendent and Engineer, which shows the operations of his Department during the year 1858, and the condition of the Water Works at the present time.

The successful laying down and protection of the Inlet pipe, and its connection with the Aqueduct, may be regarded as a substantial completion of the Works which were commenced in 1853, and estimated to cost $500,000. Bonds to that amount, drawing 7 per cent. interest, were issued and delivered to the Trustees, by whom they were disposed of at a premium.

The entire proceeds amounted to - - -	$515,600.15
The total cost of construction to this date is -	518,631.88

being an excess over the proceeds of the bonds of $3,131.73 which is to be provided for out of the sale of the $50,000 bonds authorized to be issued for the extension of pipe.

A true statement of the "Construction Account" will be found in abstract No. 1, from the Secretary's books, herein included as a part of this Report.

Abstract No. 2, from the same books (also included) exhibits the receipts and expenditures for all purposes for the year 1858, as well as the resources and liabilities of the Board.

The gross receipts for the year are, - - -	$9,847.38
Payment for running e[illegible] and repairs, - -	7,712.75
Net receipts for - - -	$2,134.63

Compared with 1857, there is an increase of Receipts of - - - - - - - - -	1,063.05
And a decrease of expenditures for running expenses and Repairs, of - - - - - - -	4,991.15
Making a total net gain of - - - - - -	$6,054.20

Less than one-fifth of this gain, however, is derived from increase of water rents. In this respect the expectations of the Board have not been realized. As objections were frequently made to the prices charged for water, the Board at the commencement of the year carefully revised their tariff and reduced the rates nearly 33⅓ per cent., but the results have not yet verified the predictions of those who so strenuously advocated a low tariff. The handsome gain of the year is to be attributed to the rigid economy which has obtained in every part of the service, and to exemption from casualties, rather than to the increased patronage of the public.

The present low rates will be continued for the ensuing year, and it is farther proposed by the Board in order to induce a more general sprinkling of the streets in the summer season—to reduce the charge of water for that purpose to a sum barely sufficient to cover the cost of supervision, so that the residents on each street, by organization and small voluntary contributions, will be able to protect themselves against the formidable annoyance of dust.

The recent issue of bonds for the extension of pipe, was, by law, restricted to 6 per cent. interest, and some delay has occurred in negotiating them, but the Board expect soon to dispose of a sufficient amount on satisfactory terms to cancel its present liabilities, and lay down some additional pipe.

The special attention of the Council is requested to the suggestions of the Engineer for the grading of Kentucky Street.

All of which is respectfully submitted.

H. B. PAYNE,
W. F. OTIS,
SAML. F. LESTER,
Trustees.

OFFICE OF WATER WORKS,
CLEVELEND, JAN. 31ST, 1859.

REPORT
OF THE
Superintendent and Engineer.

OFFICE OF WATER WORKS,
CLEVELAND, JAN. 1ST, 1859.

TO THE TRUSTEES OF WATER WORKS:

GENTLEMEN:—In compliance with the law, I submit to your honorable body the annual Report upon the progress and the present condition of the City Water Works.

I. LAKE WORK AND AQUEDUCT.

For reasons explained in last year's report, the laying of the originally designed Inlet-pipe was deferred until the present year.

Early in the Spring, proposals for the performance of this work were solicited by advertisements and the contract awarded to the lowest bidders, Messrs. Frost & Mills.

On the 15th of June the Contractors commenced operations, and the Inlet-pipe was successfully launched and sunk to its place on the 16th day of July.

The protecting tower around the well-chamber of the Inlet-pipe (400 feet from the lake shore) and all other work pertaining to the contract, was finished on the 7th of October, and the brick connection between the Inlet-pipe and the Aqueduct immediately commenced.

Considerable trouble and inconvenience was experienced in this job from the unusual hight of the water in the lake, and the difficulty of making the Cofferdam at the shore water-tight *under* the Inlet-pipe. All these difficulties, however, were overcome, and the connection successfully completed on the 30th day of October.

The supply of the water since its introduction into the City was taken through a temporary inlet at the lake shore, and the passing of sand, dead leaves and small twigs through the strainers into the Aqueduct could not be avoided. It was therefore deemed expedient to clean the Aqueduct throughout before the water was let in from the new Inlet.

Our large pumping engines were never intended to pump all the water from the Aqueduct, and if they were so constructed it would be not only dangerous to the engines to pump all the sediments through them, but also very objectionable to force anything but clear water in the reservoir. The necessary provisions for pumping the Aqueduct dry, were therefore made at the lake shore by sinking a water-tight well three feet below the bottom of the aqueduct; a channel 8 feet long, 18 inches wide by 18 inches high, forms the communication between this well and the Aqueduct, which arrangement gives the facility to empty the Aqueduct at any time by means of a small steam pump.

The Worthington Engine and Pump, used during the construction of the works, for *forcing* water on the reservoir, would require some alterations to make it more effective for the purpose of *raising* water. This alteration is highly recommended for immediate action, to have the pump in readiness for placing it into the gate-house at the lake shore in order to be prepared in case of necessity.

For the present occasion a marine pump was hired, the Aqueduct pumped dry and thoroughly cleaned.

Ample provisions had been made for a sufficient water supply to the City, before the commencement of this cleaning, and the water takers were not deprived of the water for a single hour during the performance of this job.

After the cleaning, the Aqueduct was closely inspected, and found in very good condition, being perfectly water-tight with the exception of two small leaks. It was thought best not to repair them immediately on account of the advance of the season, so much the more as their nature will permit a delay till next Spring without the least danger.

The temporary ventilators over the Aqueduct had to be taken down to admit the workmen, and to hoist from the Aqueduct the sediments accumulated therein. Next year it will be necessary to erect good, permanent ventilators of such design as to admit free access at any time without destroying them.

The building of the gate-house at the lake shore, also originally intended, but delayed on account of the lake-pipe, should be effected next year, and a final decision about the Railroad tunnel is not only desirable, but actually necessary for the safety of theAqueduct as well as the trains on the Railroad.

II. ENGINE HOUSE.

The building is in good condition, and its foundation stands firm.

The painting of the inside wood and iron work, and the tin cover of the roofs, requires an additional coat of paint during the coming season, and the joints of the metal gutters need thorough overhauling.

The improvement of the grounds around the Engine House is again recommended to your consideration. A small sum judiciously expended would bring the now unsightly place to a more improved appearance, as the earth lately dredged from the old river bed and thrown on the lot, could be distributed over the grounds at a trifling expense.

The board fences on the East and West lines of the lot should be thoroughly repaired and extended to the shore of the old river, and the erection of an outhouse is also recommended.

The frequent visits to the Water Works by citizens as well as strangers, causes Kentucky street to be as much traveled as any street in the city, and the ascending part of it from the engine house to Detroit street is in such deplorable condition, that the driving of carriages upon this road is really dangerous.

A recommendation to the City Council to the effect to grade and improve this portion of Kentucky street is very desirable, as it would not only afford more safety to visitors, but also greater protection to the ascending main.

III. PUMPING ENGINES.

During the past year the Engines did not require any repairs, and both are in perfect running order.

The loads of the pump-plungers were again reduced of 1,747 pounds each. The performed duty of the last year is very satisfactory, being an average of 42,000,000 pounds of water raised one foot high, with 100 pounds of coal consumed for raising steam and pumping. The coal used during the year was a mixture of Chippewa and Briarhill slack in equal parts, which is considered to be in effect equal to ¾ of coarse coal of the same quality.

It is advisable to prevent the loss of heat by radiation by some further protection of the boiler heads and steam pipes at a mere nominal cost, as more than the amount of the expense would be saved in fuel in

IV. RESERVOIR.

All the improvements recommended in last year's report have been executed during the past summer with the exception of the waste-pipe, which, it is hoped, the finances of the Works will permit to be laid early next spring.

The Reservoir and grounds are in an unexceptionable condition, and it is only desirable to have a small building erected upon the grounds for the storage of tools and other implements devoted to the exclusive use at the Reservoir.

V. DISTRIBUTING PIPES.

These pipes and all appurtenances are in good order; it remains for next year only to protect the river pipe on the West shore of the Cuyahoga river in a way similar to the East shore protection.

No repairs were required last year except by the starting of the lead from 4 joints of the 20 inch main, next to the West shore of the Cuyahoga river, where the pipe bends with a short curve from the river into West River street, running nearly parallel with the river.

One of these leaks was so strong that the water had to be shut off from the East side for three hours, and the inconveniences arising therefrom were felt very seriously. To prevent the recurrence of such leaks it is highly recommended to secure all these joints in the curve with suitable socket clamps.

The following table exhibits the quantity of water pipes laid in the City previously to 1858, and the addition of this year.

Diameter in inches.	24	20	16	10	8	6	4	2	3
P's laid previous to 1858	2,668	10,564	2,608	5.205	6,421	15,704	27,582	55	2,594
Pipes laid in 1858					507		8,540	292	271
Total,	2,668	10,564	2,608	5,205	6,928	15,704	36,122	347	2,865
Pipes taken up in 1858.								32	
Balance.	2,668	10,564	2,608	5,205	6,928	15.704	36,122	315	2,865
	15,840 feet.			64,274 feet.					2,865 ft

15,840 feet= 3,00 miles of main pipes,
64,274 " = 12,17 miles of distributing pipes,
2,865 " = 0,55 miles of service pipes for fire hydrants and street Cisterns.

82,979 feet=15.72 miles in total.

The eight inch pipe in Merwin street, is J. Ball's patent Iron and Cement pipe, laid as an experiment. So far, it has stood the pressure and the casualties water pipes are subjected to; but the period since it was laid is too short to give any decision about it.

I for my part can conceive of no material possessing so many advantages for the distribution of water, as cast iron. The facility and cheapness with which curves, branches or tapering pipes can be formed in cast iron, having at the same time equal strength, durability and tightness with the straight pipes, and further, the value of the old material when broken, are some of the advantages, which I cannot see, could be equally obtained with any other material.

The cost of this cement pipe compared with the cost of cast iron pipe is shown in the following table.

			CAST IRON	CEMENT.
8 inch pipe per	lineal	foot including laying,	$1,06	$1,00
6 inch pipe,	do	do	89	80
4 inch pipe,	do	do	70	54
3 inch pipe,	do	do	54	40

Valves and appurtenances being the same for both kinds of pipes, the cost of the same are excluded at the above named prices.

The prices for cast iron being ascertained from the actual outlay for pipes laid and those for the cement pipe, are Mr. Ball's prices, given in this office.

The 2 inch cast iron pipe laid during the summer, supplies "Oak Place" with water. Although this pipe is considered to answer in this particular place, it is thought not advisable to be recommeded for other streets.

The two inch pipe laid in 1857, for street sprinkling, and which is deducted in the above table, has been taken up and sold.

In addition to the previous 413 permits, 186 new ones were issued during the year, making a total of 599 permits.

Schedule A. gives the localities and extent of the pipes laid in 1858.

Schedule B. is a list of the stop valves used in this pipe extension.

Schedule C. gives the number and places of the fire hydrants added this year to the 74 already in use.

The hydrant at the head of Prospect street was removed to the corner of Euclid and Hudson street. It was erected at its former place chiefly for the purpose of occasionally drawing off the water at the end of the Prospect street pipe, but since the extension of the pipes through Hudson street and on Euclid street was effected, this necessity exists no longer, and for fire purposes the street cistern at the same place connected with the water-pipes is used.

Among the new hydrants is one of "Higgs patent," sent to this office free of charge, by Messrs. Higgs & Townsend, of Utica, for a trial, and which the inventor agreed to take back, should it prove not to be far superior to the hydrants in use here. This hydrant is efficient and substantial, but all the superiorities claimed for it, our hydrants are possessing also, besides their greater simplicity in construction.

The facilities for extinguishing fires were further increased by the connection of one street reservoir, the locality of which is also shown in Schedule C.

Schedule D. gives the quantity of pipes and attachments in store. The propriety of having a larger stock on hand for any accident or emergency is not doubted, and your consideration of the subject is earnestly solicited.

The purchase of some Water-meters is likewise submitted to your consideration, particularly to convince the consumers of large quantities of water about the inconsiderable price they pay for the water they use. The increase of the water rent from a single rectifying or meat-packing establishment, would pay in one year more than the price of the meter.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer Cleveland Water Works.

SCHEDULE A.

Showing the Pipes laid during the year 1858.

Diameter of pipes in inches.	IN WHAT STREET.	BETWEEN WHAT STREETS.	FEET LAID	TOTAL	REMARKS.
8	Merwin,	Canal B. & Centre st.	507	507	Ball's patent Iron & Cement Pipe.
4	Pearl,	Franklin & Chatham,	2,141		Cast iron pipes.
4	Merwin,	Centre & Columbus,	1,353		"
4	Columbus,	Centre & Merwin,	1,970		"
4	Leonard,	Columbus & Girard,	80		"
4	Bank,	Lake & Wall,	352		"
4	West st. of Pub. Sq	Superior & Rockwell,	285		"
4	East st. of Pub. Sq.	Euclid towards Pros't	24		"
4	Hudson,	Euclid & Prospect,	481		"
4	Euclid,	Hudson & Perry,	910		"
4	Centre,	Merwin & Cuy'a river,	50		"
4	Ohio,	Kinsman & Canal,	894		"
				8,540	
3	Pearl,	Corner of Jay,	34		Fire hyd't connec.
3	"	Opposite Carroll,	27		"
3	"	Intersection of Lorain	6		St. cistern connec.
3	"	Corner of Chatham,	37		Fire hyd't connec.
3	Merwin,	Corner of West,	31		Cem't P., fire hyd't
3	"	" Leonard,	27		Fire hyd't connec.
3	"	" German,	30		"
3	"	" French,	28		"
3	"	" British,	29		"
3	East st. of Pub. Sq.	" Euclid,	10		"
3	Hudson,	" Euclid,	12		Add to former pipe
				271	
2	Oak Place.	Prospect and Euclid,		292	
		Total,		9,610	or 1,82 miles.

SCHEDULE B.

Showing the number and location of Stop Valves put down in 1858.

Number.	Waterway in inches.	LOCATION.
1	4	In Pearl street, on South line of Jay street,
1	"	do do Carroll street,
1	"	do do Lorain street.
1	"	In Merwin street on South line of Centre street,
1	"	do do German street.
1	"	do North line of British street,
1	"	In Columbus street on North line of Gravity place.
1	"	do South line of Girard street.
1	"	do North line of Merwin street.
1	"	In West street of Public Sq., on North line of Superior street.
1	"	In Hudson street, on North line of Prospect street.
1	"	In Euclid street, on West line of Hudson street.
12	4	Inch valves.
84	"	Inch valves set previous to 1858.
96	4	Inch valves in total,
1	2	In Oak Place on North line of Prospect street.

SCHEDULE C.

Showing the number and location of Fire Hydrants, and street Cistern connections made in 1858.

Number.	IN WHAT STREET.	BETWEEN WHAT STREET.	SIDE OF STREET.
1	Pearl,	Corner of Jay street,	West,
2	"	Opposite Carroll street,	East,
3	"	Corner of Chatham do	West,
4	Merwin,	do West do	East,*
5	"	do Leonard do	"
6	"	do German do	"
7	"	do French do	"
8	"	do British do	"
9	E. st. of Pub. Sq.	do Euclid do	South,

* This Hydrant is Higg's Patent.

Hydrant No. 26 in last year's report, was taken up and removed to the corner of Euclid street, so that it reads now: 26 Hudson, corner of Euclid, West.

The street Reservoir No. 7 of last year's report at the intersection of Pearl and Lorain street, was also connected with the water pipes, thereby making the number of supplied street cisterns 21 out of 43.

SCHEDULE D.

Statement of Pipes and attachments on hand.

		FEET	IN.
2	whole 20 inch pipe,	18	
7	pieces 20 inch pipe together.	30	6
	Total of 20 inch pipe.	48	6
1	whole 16 inch pipe,	9	
5	pieces “ “ together.	23	4
	Total of 16 inch pipe.	32	4
2	whole 10 inch pipe,	18	
	Total of 10 inch pipe.	18	
6	whole 8 inch pipe.	54	
5	pieces “ “ together.	17	1
	Total of 8 inch pipe.	71	1
3	whole 6 inch pipe,	27	
1	piece “ “	5	
1	whole extra strong 6 in. pipe,	9	
	Total of 6 inch pipe,	14	
3	whole 4 inch pipe,	27	
4	pieces “ “ together.	21	8
	Total of 4 inch pipe.	48	8
3	whole 2 inch pipe,	27	
8	pieces “ “ together.	32	6
	Total of 3 inch pipe.	59	6
1	whole 3 inch pipe,	6	
1	piece “ “	5	
	Totol of 2 inch pipe.	11	
1	8 inch 2 way branch, N. P.		
3	6 “ “ “ O. P.		
1	6 “ “ “ N. P.		
6	4 “ “ “ N. P.		
2	10 inch 1 “ “ N. P.		
1	6 “ “ “ O. P.		
57	valve box, covers and frames,		
2	valve boxes,		
1	8 inch pipe for testing valves,		
1	8 inch standpipe 17 ft. 6 in. long,		
2	flanched 4 inch pipes,		
1	pipe press,		
1	lot of gaskets for testing pipes,		
1	stopcock cylinder and cover,		
2	sidewalk stopcock box covers.		

1 reducing pipe from 36 in. to 24 in.
1 “ “ 24 in. to 20 in.
1 “ “ 16 in. to 10 in.
3 “ “ 10 in. to 8 in.
1 “ “ 10 in. to 6 in.
1 “ “ 8 in. to 6 in.
6 “ “ 8 in. to 3 in.
4 “ “ 6 in. to 3 in.
2 6 inch Y pipes.
1 4 “ “
2 20 inch curves.
7 10 “ “
6 8 “ “
4 6 “ “
8 4 “ “
1 24 “ sleeve.
4 20 “ “
1 16 “ “
4 10 “ “
1 8 “ “
4 pair of 6 inch socket clamps.
1 “ 4 “ “ “
1 “ 24 inch wrought clamps.
1 “ 20 “ “ “
3 “ 24 “ cast “
4 “ 8 “ “ “
1 24 inch valve,
2 16 “ “
1 10 “ “
2 8 “ “
17 6 “ “
Ferrule numbers from 600 to 699.
16 ferrule letters,
1 1 inch ferrule.
13 ¾ “ “
88 ⅝ “ “
19 ⅝ corporation cocks & couplings
1 Fire Hydrant complete,
2 3 inch brass cocks,
1 1½ “ “ for testing valves.

1858. CONSTRUCTION ACCOUNT.

DEBITS.		CREDITS.	
Engineering account—amount paid, - -	$16,475.14	Bonds—amount issued, - - - - - -	500,000.00
Incidental and Office expenses, - - -	4,094.01	Interest and Premiums received on Bonds, - -	15,214.54
Reservoir—cost of construction, - - -	81,589.88	Miscellaneous Items, - - - - - - -	385.61
Pipe and pipe laying—amount expended, -	201,201.20		515,600.15
Engine House and Engine—cost of construction,	168,239.87	Borrowed of running account, - - - -	3,131.73
Aqueduct—cost of construction, - - -	46,777.53	Total, - - - - - - - - -	518.731.88
Miscellaneous items, - - - -	354.25		
Total, - - - - - - - -	518,731.88		

DEBITS.			CREDITS.		
Cash on hand Jan. 1st, 1858, as per report viz:			Cash paid as per Cash Book, - - - - -		$361.51
Cash, - - - - - -	$809.71		Cash paid Running Account—difference in transfer,	$2,827,48	
Loaned Running Account, -	6,142.22	$6,951.93	Of account to Water Rent Ledger,	1,606.30	1,221.18
Cash received as per Cash Book, - -		1,036.80	Cash paid on account Aqueduct—laying inlet pipe,		9,537.77
		7,988.73	Total, - - - - - - - - -		11,120.46
Borrowed of Running Account as above, -		3,131.73			
Total, - - - - - - -		11,120.46			

CLEVELAND WATER WORKS OFFICE,
JANUARY 1, 1859.

GEO. W. GIRTÝ, *Secretary.*

1858. WATER RENT BOOKS.

DEBITS.

Cash received for Water rent for 1858,	$8,466.06
" Ferrules, " "	558.00
" Miscellaneous, "	823.32
Total receipts,	$9,847.38
Less am't paid for running expenses and repairs, 1858,	7,712.75
Net receipts for 1858,	$2,134.63
Expenses more than receipts from the commencement to January 1, 1858,	5,648.73
Expenses more than receipts Jan. 1, 1859.	$3,514.10

Water Rent account—for balance as per above statement,	$3,514 10
Construction account—for am't loaned to complete the Aqueduct,	3,131.73
City of Cleveland—for amount due,	52.45
Pipe extension—for amount expended,	7,039.71
Bills receivable—for amount due,	186.98
Cash—amount on hand,	500.06
	$14,425.03

We owe as follows:

Personal accounts—for am'ts. advanced by individuals to lay pipe,	$6,387.35
J. Ball & Co.—for Patent Iron and Cement pipe, laid on contract,	544.45
Carpenter, Gerry & Co.—for pipe furnished,	2,073.23
Bills payable—for money borrowed,	5,350.00
Coupon account—for coupons due but not presented,	70.00
	$14,425.03

Cleveland Water Works Office,
January 1, 1859.

GEO. W. GIRTY, Sec'y.

CLEVELAND WATER WORKS.

WATER TARIFF FOR 1859.

ORDERED, That the following Rates for supplying Water, per year, shall be charged to consumers, payable semi-annually in advance, at the Office of the Trustees of Water Works:

Dwelling Houses, not exceeding five rooms,	$5 00
Each additional room,	50
(Including use of plug and water closet.)	
Bathing Tubs, each,	2 00
Water Closets,	2 00 to 5 00
Hotels, per room,	1 00
Boarding Houses, per room,	1 00
Bathing Houses, per tub,	5 00 to 10 00
Saloons and Eating Houses,	5 00 to 25 00
Livery Stables, per stall up to ten stalls,	2 00
Each additional stall,	1 00
Private Stables,	2 00
Bakeries,	5 00 to 1 00
Stores, with or without plugs,	5 00
Offices and Sleeping rooms,	2 00 to 5 00
Churches,	5 00 to 10 00
Schools,	5 00 to 10 00
Cabinet and Carpenter Shops,	5 00
Printing Offices,	5 00 to 10 00
Market Stalls,	3 00
Markets,	5 00 to 20 00
Stone Yards,	5 00
Blacksmith Shops, per fire,	2 00
Steam Engines, per horse power,	2 00
Steam apparatus for warming houses and other buildings to be assessed.	
Colleges, Hospitals, Court Houses and Jails, to be assessed.	
Water to sprinkle streets to be assessed.	
Distilleries and Rectifiers, Gas Works, Breweries and Malt Houses, Packing Houses, Slaughter Houses and Railroads, to be charged	1¼ cts. per bbl
Founderies and Machine Shops,	1½ cts. per bbl.
Building purposes —100 bushels lime,	$2 00
Stone, per perch,	2
Brick, per thousand,	5
Private Fountains,	$ 5 00 to $25 00

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1906

ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1859.

4

REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

For the Year 1859.

173703

Cleveland Water Works.

WATER TARIFF FOR 1859.

Ordered, That the following Rates for supplying Water, per year, shall be charged to consumers, payable semi-annually in advance, at the Office of the Trustees of Water Works :

Dwelling Houses, not exceeding five rooms	$ 5 00
Each additional room	50
(Including use of plug and water-closet.)	
Bathing Tubs, each	2 00
Water-Closets	$2 00 to 5 00
Hotels, per room	1 00
Boarding Houses, per room	1 00
Bathing Houses, per tub	$5 00 to 10 00
Saloons and Eating Houses	5 00 to 25 00
Livery Stables, per stall up to ten stalls	2 00
Each additional stall	1 00
Private Stables	2 00
Bakeries	$5 00 to 10 00
Stores, with or without plugs	5 00
Offices and Sleeping Rooms	$2 00 to 5 00
Churches	5 00 to 10 00
Schools	5 00 to 10 00
Cabinet and Carpenter Shops	5 00
Printing Offices	$5 00 to 10 00
Market Stalls	3 00
Markets	$5 00 to 20 00
Stone Yards	5 00
Blacksmith Shops, per fire	2 00
Steam Engines, per horse power	2 00
Steam apparatus for warming houses and other buildings, to be assessed.	
Colleges, Hospitals, Court Houses and Jails, to be assessed.	
Water to sprinkle streets, to be assessed.	
Distilleries and Rectifiers, Gas Works, Breweries and Malt Houses, Packing Houses, Slaughter Houses and Railroads, to be charged	1¼ cts. per bbl.
Foundries and Machine Shops	1½ cts. per bbl.
Building purposes—100 bushels lime	$ 2 00
Stone, per perch	2 00
Brick, per thousand	5 00
Private Fountains	$5 00 to 25 00

REPORT

OF THE

Trustees of Water Works.

To the Hon. Mayor and Common Council of Cleveland:—

The Trustees of the Water Works herewith submit the annual report of the Superintendent and Engineer, which exhibits the condition of the Works, and the operations in his department during the year.

The report of the Secretary shows the receipts and expenditures during the year.

We have examined the reports and find them full and explicit, and anything we may say in addition seems uncalled for. We therefore respectfully submit the reports.

W. F. OTIS,
S. F. LESTER,
WM. B. CASTLE,
Trustees of the Water Works.

Water Works Office,
Cleveland, Jan. 1st., 1860.

Report of the Secretary.

To the Trustees of the City Water Works:

Gentlemen:—I herewith submit to you a statement showing the receipts and expenditures of money on account of the Water Works for the year 1859.

The receipts for water, over running expenses and repairs, amount to five thousand two hundred one dollars and twenty-six cents ($5,201.26); showing a gain over receipts of 1858 of three thousand nine hundred and seventy-seven dollars and fifty one cents ($3,977.51), whilst the running expenses and repairs for 1859 are in excess of 1858 only nine hundred ten dollars eighty-eight cents ($910.88.)

The running expenses and repairs of the works have exceeded the receipts for water from the commencement of running the works to January 1st, 1859, three thousand five hundred fourteen dollars and ten cents ($3,514.10), which will reduce the net receipts for Water to January 1st, 1860, to sixteen hundred eighty-seven dollars and sixteen cents ($1,687.16). This amount of net receipts will be applied to the payment of interest on the Water Bonds, or to the extension of the Works, as the Trustees may determine.

We have 832 connections, or regular water takers, and about 168 irregular, or persons taking water from those who have made connections; in all about 1,000 takers of water. Of this number 115 did not renew their leases in the months of November and December, thereby reducing the receipts for water some four hundred dollars. These parties, upon application for the renewal of their leases, will be subject to the back rent and the penalties as prescribed by the rules and regulations of the Trustees of the Water Works.

Some two years since the City voted an appropriation of fifty thousand dollars, in City Bonds, for the completion and extension of the Water Works; of this amount thirty-five thousand dollars have been sold, and the proceeds have been so appropriated, leaving a balance of fifteen thousand dollars of bonds on hand, unsold, as appears from the statement hereto annexed.

Respectfully submitted,

GEO. W. GIRTY, Secretary.

Water Works Office,
Cleveland, Jan. 1, 1860.

STATEMENT

Of the Receipts and Expenditures of money received for Water for the year 1859, on account of the Cleveland Water Works, as per Monthly Statements submitted to the City Council.

EXPENDITURES.		RECEIPTS.	
January	$ 464 71	January	$ 543 16
February	725 02	February	345 05
March	947 83	March	457 49
April	780 01	April	1,194 63
May	734 69	May	1,904 49
June	688 93	June	1,735 50
July	713 96	July	1,262 50
August	568 47	August	720 58
September	760 70	September	1,440 99
October	571 27	October	1,343 48
November	1,035 38	November	1,585 92
December	642 14	December	1,451 13
	$ 8,633 11		$13,984 92
Expenditures credited	9 48	Water rent returned for the year	160 03
Running expenses and repairs, 1859	$ 8,623 63	Receipts for water, 1859	$13,824 89
			8,623 63

Receipts over expenses, 1859	$ 5,201 26
Running expenses and repairs more than receipts for water from commencing to run the works to January 1, 1859	3,514 10
Net receipts to January 1, 1860	$ 1,687 16

CASH ACCOUNT, 1859.

Cash on hand January 1st, 1859, as per Report			$ 500 06
Cash received for water		$13,984 92	
Deduct running expenses	$ 8,260 68		
Deduct repairs	362 95		
Deduct returned water rent	160 03		
		8,783 66	
			5,201 26
Cash received for water bonds		35,000 00	
Deduct discount paid	$ 2,570 00		
Deduct commission paid	58 75		
		2,332 99	
	$ 2,628 75		32,667 01
Add accrued interest received	295 76		
Cash received for iron, etc., sold, belonging to Construction Fund account			778 31
Cash received from "Ocean Bank" bond account			172 50
Cash received on bills receivable			186 98
Cash received from City of Cleveland			248 39
Cash received from the city to pay interest on bonds			19,145 90
			$58,900 31

Cash paid for pipe extension	$25,876 01
Cash paid J. Ball & Co.	500 77
Cash paid S. M. Carpenter & Co.	346 31
Cash paid bills payable	5,350 00
Cash paid personal accounts as per Report to January 1, 1859	6,387 35
Cash paid Ocean Bank to pay interest	19,155 00
Cash paid bills receivable (credited Construction Fund account)	250 00
Cash paid for account of City of Cleveland	673 47
Cash on hand January 1, 1860	361 40
	$58,900 31

LEDGER BALANCES, JANUARY, 1860.

DEBITS.		CREDITS.	
Cash	$ 361 40	Water rent	$ 1,687 16
Construction Fund	2,353 52	Coupons	19,215 90
City of Cleveland	477 53	J. Ball & Co.	43 68
Pipe extension	32,915 72	Interest and exchange	295 76
Ocean Bank, coupon account.	19,155 00	S. M. Carpenter & Co.	1,726 92
Bills receivable	250 00	Ocean Bank, bond account	172 50
Commissions	58 75	Bonds	35,000 00
Discount	2,570 00		
	$58,141 92		$58,141 92

ASSETS.		LIABILITIES.	
Cash on hand	$ 361 40	S. M. Carpenter & Co.	$ 1,726 92
Bills receivable	250 00	J. Ball & Co.	43 68
Bonds on hand unsold	15,000 00	Ocean Bank	17 50
Account against City of Cleveland	477 53	Coupon account	215 90
	$16,088 93		$ 2,004 00

REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, Jan. 1, 1860.

To the Trustees of Water Works:

Gentlemen:—In submitting to you the fourth annual report, it affords me particular pleasure to state that the works throughout are in the best desirable condition, and the prospects for their future welfare are very encouraging.

The several distinct parts of the works you will please find described under their respective titles, as follows:

I. LAKE WORK AND AQUEDUCT.

The inlet tower in the lake stood during the whole year very well. The heavy gales we experienced in the spring and fall had not the least effect upon it, and when no extraordinary accident occurs it will be the source of a bountiful supply of pure water to our city for many years to come.

It was contemplated to complete the protection of the inlet pipe on the lake shore at the same time with the gate-house, and the permanent establishment of the tunnel through the railroad embankment, all of which is highly recommended to your consideration, as upon the safety of this important part of the works the flourishing condition of the whole is depending.

The aqueduct is in perfect order. The ventilators will be permanently covered early next spring, in conformity with the plan you ordered to be executed.

II. THE ENGINE HOUSE.

Is in good order; it will, however, be necessary next year to give the woodwork an additional coat of oil paint, and the bolts of the main beam have to be tightened. Should you think proper to repair the fences and improve the grounds the whole would appear more like a public institution, and the impression on visitors would be more favorable. In its present state the lot looks unsightly and neglected.

III. THE PUMPING ENGINES

Required no repairs during the year, and have considerably improved in duty. The average during the summer being 50,000,000 pounds of water raised one foot high with 100 pounds of coal for raising steam and pumping.

The favorable results from the use of slack for fuel (commenced the previous year), recommended its continuance, and by using pure Chippewa slack even more advantage was obtained than last year.

IV. THE RESERVOIR

Is in an excellent state of preservation. The turf appeared during the season very vigorously, and the inside lining did not suffer from the frost last winter.

The contemplated waste-pipe for the outlet of the water, should the pumping into the reservoir be continued too long at any one time, was laid during the season and thereby all danger from overflow entirely obviated.

V. THE DISTRIBUTING PIPES

And appurtenances are all in good order. The protection of the river pipe, recommended in last year's report, has been executed and no serious trouble was experienced by leaks or breaks. One leak occurred in West River street on the 20-inch main, near the Canal bridge, where the pipe lies fifteen feet under ground.

From the Canal, southwards, for about 200 feet the 20-inch pipe is covered about two feet high with gravel, and the balance of the trench shored by means of timbers and sheet piles, terminating about three feet below the surface of the street, where the trench is covered with planks and the roadway restored above them.

By digging for the above mentioned leak the timbers were found decayed to a great extent and to guard against any accident it is thought very advisable to take all these timbers out and to form a tunnel of a more durable material.

The following table exhibits the water pipes laid in the City previously to 1859, and the extension of the same year:

Diameter in Inches.	24	20	16	10	8	6	4	2	3
Pipes laid previous to 1859	2,668	10,564	2,608	5.205	6.928	15.704	36,122	315	**2,865**
Pipes laid in 1859		114			4,235	4,305	25,938	133	**1,576**
Total	2,668	10,678	2,608	5,205	11,163	20.009	62,060	448	**4,441**
Pipes taken up in 1859.....							110		**29**
Balance	2,668	10,678	2.608	5.205	11,163	20,009	61,950	448	**4,412**
	15.954 feet.			98,775 feet.					**4,412 feet.**

15,954 feet or 3.021 miles of main pipes.
98,775 feet or 18.707 miles of distributing pipes.
4,412 feet or 0.836 miles of service pipe for fire hydrants.

119,141 feet or 22.564 miles in total.

Which shows an increase of 36,162 feet or 6.844 miles
year.

The financial report of the Secretary demonstrates that the advocates of extension of the distributing pipes were right in their prediction, and your liberal adhesion to this policy is the chief cause of the very satisfactory increase in the revenue of the Works. The surplus pays not only the interest on the capital invested in the extension, but also a portion of those on the previous indebtedness.

It is thought not to be out of place to submit to your consideration the following suggestions:

The plan after which our beautiful city is built, by spreading the same over a large area, is decidedly the best, in a sanitary view, and the citizens have a right to be proud of the fame of the City for its healthfulness; but the same is a great disadvantage to Water Works when compared with other cities where the houses are built closer together and the population is more dense.

To obviate this disadvantage, and to distribute the water-tax more equally, it is suggested to assess all the property in streets where water pipes are laid, per lineal foot, independent of any improvement upon the lot, and then to charge for the use of the water in the buildings at a still more reduced rate.

This mode of assessment would bring a revenue from all property actually benefited by the introduction of the water into the street, and the further reduced rates for the consumption of the water would enable even the poorest tenants to enjoy the benefit of an abundant water supply.

It is also thought advisable to recommend the purchase of some meters for large consumers, as the present mode of assessing those is based on mere conjecture of the quantity of water used.

A single example will illustrate this sufficiently. For instance, a brewery wants to use water from your works for manufacturing purposes, and you are informed that the establishment intends to make 2,000 barrels of beer per year; you assess accordingly, and the water rent is paid; but the brewer makes 7,000 barrels instead of 2,000, and consequently you lose the payment for water for 5,000 barrels of beer, or in other words you receive only two-sevenths of the water rent chargeable to the establishment. The unpaid five-sevenths of one year would pay the cost of the meter whilst the brewer would not pay a single cent more than he actually consumes.

The annexed Schedules A. and B. exhibit the extension of water pipes during the year, more particularly. Schedule C. shows that the facilities for extinguishing fires were considerably increased, by having 49 new fire hydrants added to the previous 84, making a total of 132 fire hydrants. In addition to those, three street reservoirs have been connected with the water pipes, thus making in all 24 cisterns, out of 43, connected with the Water Works.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer.

SCHEDULE A.

Showing the extension of water pipes during the year 1859.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
20	On Reservoir	Waste pipe in West embankment	114		Cast iron.
				114	
8	Reservoir lot.	Between waste and drain pipe	210		Cast iron.
8	Merwin	Superior and s. side of Canal	668		Cast iron.
8	St. Clair	Erie and Perry	3,557		Cement pipe.
				4,235	
6	St. Clair	Perry and Williams	4,305		Cement pipe.
				4,305	
4	Euclid	Perry and Hudson	72		Cast iron.
4	Euclid	Hudson and Willson avenue	3,926		Cement pipe.
4	Huron	Pittsburgh and Erie	1,500		Cast iron.
4	Mandrake	Water and Spring	380		Cast iron.
4	Chesnire	Prospect and Garden	973		Cement pipe.
4	Pittsburgh	Eagle and Ohio	600		Cast iron.
4	Pittsburgh	Ohio and Perry	2,448		Cement pipe.
4	Cross	Across Pittsburgh and Orange	164		Cement pipe.
4	Hamilton	Wood and Erie	1,120		Cast iron.
4	Merwin	British and Columbus	205		Cast iron.
4	Leonard	Across Columbus	38		Cast iron.
4	Muirson	Across St. Clair	99		Cement pipe.
4	Clinton	Across St. Clair	53		Cement pipe.
4	Marshall	Across St. Clair	54		Cement pipe.
4	Perry	Across St. Clair	99		Cement pipe.
4	Minnesota	Across St. Clair	43		Cement pipe.
4	Alabama	Across St. Clair	43		Cement pipe.
4	Depot	St. Clair and the Lake	1,307		Cement pipe.
4	Delaware	Across St. Clair	45		Cement pipe.
4	Sterling av.	St. Clair and Lake	749		Cement pipe.
4	Waring	Across St. Clair	43		Cement pipe.
4	Rossiter	Across St. Clair	43		Cement pipe.
4	Lawrence	Across St. Clair	99		Cement pipe.
4	Phelps	Across St. Clair	44		Cement pipe.
4	Merchant	Across St. Clair	40		Cement pipe.
4	Williams	Superior and Willson	1,725		Cement pipe.
4	Lake	Williams and Case avenue	727		Cement pipe.
4	Wood	Lake and St. Clair	720		Cast iron.
4	Bond	Hamilton and St. Clair	143		Cast iron.
4	Vestry	Pearl and York	583		Cement pipe.
4	Perry	Prospect and Cedar	776		Cement pipe.
4	Sibley	Across Perry	34		Cement pipe.
4	Perry	Marion and Kinsman	1,254		Cement pipe.
4	Scovill	Across Perry	59		Cement pipe.
4	Granger	Prospect and Garden	1,042		Cement pipe.
4	Kinsman	Perry and Jackson	1,212		Cement pipe.
4	Charles	Across Kinsman	54		Cement pipe.
4	Irving	Arcoss Kinsman	43		Cement pipe.
4	Henry	Across Kinsman	54		Cement pipe.
4	Lorain	Pearl and Tracy	1,346		Cement pipe.
4	Bolivar	Pittsburg and Erie	1,339		Cast iron.
4	River	Across Superior	34		Con. with 20 in. main.

SCHEDULE A—Continued.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
4	St. Clair	River and Water	606	....	Cast iron
			———	25,938	
2	Williams	Willson and the lake	133	....	Cement pipe.
			———	133	
3	Merwin	Corner of James	19	....	Fire hydrant.
3	St. Clair	Corner of Muirson	39	....	Fire hydrant.
3	St. Clair	Corner of Clinton	42	....	Fire hydrant.
3	St. Clair	Between Clinton and Marshall......	35	....	Fire hydrant.
3	St. Clair	Corner of Marshall	42	....	Fire hydrant.
3	St. Clair	Between Marshall and Perry	30	....	Fire hydrant.
3	St. Clair	Opposite South Perry	34	....	Fire hydrant.
3	St. Clair	Between Perry and Minnesota	33	....	Fire hydrant.
3	St. Clair	Between Perry and Minnesota	41	....	Fire hydrant.
3	St. Clair	Corner of Alabama	19	....	Fire hydrant.
3	St. Clair	Corner of Sterling avenue	41	....	Fire hydrant.
3	St. Clair	Corner of Rossiter	15	......	Fire hydrant.
3	St. Clair	Opposite Phelps	46	....	Fire hydrant.
3	St. Clair	Corner of Williams	29	....	Fire hydrant.
3	Huron	Opposite Miami	28	....	Fire hydrant.
3	Huron	Corner of Third alley	38	....	Fire hydrant.
3	Mandrake ...	At its Western terminus	5	....	Fire hydrant.
3	Cheshire	Between Prospect and Garden	20	....	Fire hydrant.
3	Cheshire	Corner of Garden	30	....	Fire hydrant.
3	Pittsburgh ...	Between Ohio and Cross	32	....	Fire hydrant.
3	Pittsburgh ...	Between Cross and Perry	31	....	Fire hydrant.
3	Pittsburgh ...	Between Cross and Perry	39	....	Fire hydrant.
3	Pittsburgh ...	Between Cross and Perry	31	....	Fire hydrant.
3	Cross	Corner of Orange	16	....	Fire hydrant.
3	Hamilton	Corner of Wood	26	....	Fire hydrant.
3	Hamilton	Corner of Depot	38	....	Fire hydrant.
3	Hamilton	Corner of Sterling avenue	5	....	Cistern Conn.
3	Hamilton	Corner of Williams	38	....	Fire hydrant.
3	Lake	Corner of Depot	40	....	Fire hydrant.
3	Lake	Corner of Williams	27	....	Fire hydrant.
3	Lake	Corner of Case avenue	44	....	Fire hydrant.
3	Bond	Corner of Hamilton	34	....	Fire hydrant.
3	Vestry	Corner of York	18	....	Fire hydrant.
3	Perry	Between Sibley and Cedar	16	....	Fire hydrant.
3	Perry	Corner of Scovill	18	....	Fire hydrant.
3	Perry	Between Scovill and Kinsman......	24	....	Fire hydrant.
3	Granger	Between Prospect and Garden	21	....	Fire hydrant.
3	Kinsman	Between Perry and Irving	32	....	Fire hydrant.
3	Kinsman	Corner of Henry	41	....	Fire hydrant.
3	Kinsman	Corner of Jackson	4	....	Cistern Conn.
3	Lorain	Corner of Hicks	20	....	Fire hydrant.
3	Lorain	Corner of Columbus	28	....	Fire hydrant.
3	Bolivar	Between Miami	27	....	Fire hydrant.
3	Bolivar	Corner Third alley	8	....	Cistern Conn.
3	River	Between Superior and St. Clair......	19	....	Fire hydrant.
3	Vineyard	Corner of Champlain	27	....	Fire hydrant.
3	[illegible]	Opposite Winter	22	....	Fire hydrant.
		Corner of Leonard	41	....	Fire hydrant.
		rner of Girard	22	....	Fire hydrant.
		r of Merwin	31	....	Fire hydrant.

SCHEDULE A—Continued.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
3	Ohio	Corner of Miami	51	....	Fire hydrant
3	Ohio	Opposite Homoeopathic College......	31	....	Fire hydrant
3	Meadow	Between Front and Lighthouse	24	....	Fire hydrant
3	Rockwell	West side of Park	18	....	Fire hydrant
3	Euclid	West side of Park	46	....	Fire hydrant
			——	1,756	
		Total	....	36,301	

The 4-inch pipe taken up during the year, laid in St. Clair street, across Erie, to supply street cistern, the 8-inch St. Clair street pipe taking its place. The 3-inch pipe taken up was two fire hydrant connections, removed from Kinsman street.

SCHEDULE B.

Showing the number and location of stop valves used in the extension during 1859.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	8	Reservoir lot	On West side of reservoir, in drain pipe
1	8	Merwin	South line of Superior.
1	8	Merwin	North line of Canal Bridge.
1	8	Merwin	South line of Canal Bridge.
1	8	Merwin	North line of Centre.
1	8	St. Clair	East line of Erie.
1	8	St. Clair	East line of Muirson.
1	8	St. Clair	East line of Clinton.
1	8	St. Clair	East line of Marshall.
9	8	inch Valves.	
1	6	St. Clair	East line of Perry.
1	6	St. Clair	West line of Minnesota.
1	6	St. Clair	East line of Sterling avenue.
1	6	St. Clair	East line of Lawrence.
1	6	St. Clair	East line of Williams.
5	6	inch Valves.	
1	4	Euclid	East line of Hudson.
1	4	Euclid	West line of Case avenue.
1	4	Euclid	East line of Park.
1	4	Huron	East line of Pittsburgh.
1	4	Huron	South line of Prospect.
1	4	Mandrake	West line of Water.
1	4	Cheshire	South line of Prospect.
1	4	Cheshire	North line of Garden.
1	4	Pittsburgh	South line of Kinsman.

SCHEDULE B—Continued.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	4	Pittsburgh	North line of Ohio.
1	4	Pittsburgh	South line of Ohio.
1	4	Pittsburgh	West line of Cross.
1	4	Cross	South line of Pittsburgh.
1	4	Cross	North line of Orange.
1	4	Hamilton	West line of Bond.
1	4	Hamilton	West line of Erie.
1	4	Muirson	North line of St. Clair.
1	4	Muirson	South line of St. Clair.
1	4	Clinton	North line of St. Clair.
1	4	Marshall	North line of St. Clair.
1	4	Perry	North line of St. Clair.
1	4	Perry	South line of St. Clair.
1	4	Minnesota	South line of St. Clair.
1	4	Alabama	South line of St. Clair.
1	4	Depot	North line of St. Clair.
1	4	Depot	North line of Hamilton.
1	4	Depot	North line of Lake.
1	4	Delaware	Sonth line of St. Clair.
1	4	Sterling avenue	North line of St. Clair.
1	4	Sterling avenue	South line of St. Clair.
1	4	Sterling avenue	North line of Hamilton.
1	4	Waring	South line of St. Clair.
1	4	Rossiter	South line of St. Clair.
1	4	Lawrence	North line of St. Clair.
1	4	Lawrence	South line of St. Clair.
1	4	Williams	North line of Lake.
1	4	Williams	North line of Hamilton.
1	4	Williams	North line of St. Clair.
1	4	Williams	South line of St. Clair.
1	4	Lake	East line of Williams.
1	4	Lake	West line of Case avenue.
1	4	Wood	South line of Lake.
1	4	Wood	North line of St. Clair.
1	4	Vestry	West line of Pearl.
1	4	Vestry	East line of York.
1	4	Perry	South line of Prospect.
1	4	Perry	North line of Cedar.
1	4	Perry	South line of Scovill.
1	4	Perry	North line of Kinsman.
1	4	Granger	South line of Prospect.
1	4	Granger	North line of Garden.
1	4	Kinsman	West line of Charles.
1	4	Lorain	East line of Pearl.
1	4	Lorain	East line of Hicks.
1	4	Lorain	West line of Columbus.
1	4	Lorain	West line of Tracy.
1	4	Bolivar	East line of Miami.
1	4	Bolivar	West line of Erie.
1	4	River	Connection with 20-inch main.
1	4	St. Clair	East line of River.
1	4	Ohio	West line of Miami.
61	4	inch Valves.	

RECAPITULATION.

Nine 8-inch Valves, 5 6-inch Valves, 61 4-inch valves; 75 valves in total.

One 6-inch v[illegible]t, between Cross and Burnham Street, was taken out and placed in [illegible]e of Erie Street.

SCHEDULE C.

Showing the number and location of Fire Hydrants and Street Cistern connections made with pipe extensions in 1859.

No.	STREET.	LOCATION.	SIDE OF S
1	Merwin	Corner of James	**East.**
2	St. Clair	Corner of Muirson	**South.**
3	St. Clair	Corner of Clinton	**North.**
4	St. Clair	Between Clinton and Marshall	**South.**
5	St. Clair	Corner of Marshall	**North.**
6	St. Clair	Between Marshall and Perry	**South.**
7	St. Clair	Opposite South Perry	**North.**
8	St. Clair	Between Perry and Minnesota	**South.**
9	St. Clair	Corner of Alabama	**South.**
10	St. Clair	Corner of Sterling avenue	**North.**
11	St. Clair	Corner of Rossiter	**South.**
12	St. Clair	Opposite Phelps	**North.**
13	St. Clair	Corner of Williams	**South.**
14	Huron	Opposite Miami	**North.**
15	Huron	Corner of Third alley	**South.**
16	Mandrake	At its Western terminus	**Center of st**
17	Cheshire	Between Prospect and Garden	**East.**
18	Cheshire	Corner of Garden	**West.**
19	Pittsburgh ...	Between Ohio and Cross	**West.**
20	Pittsburgh ...	Between Cross and Perry	**West.**
21	Pittsburgh ...	Between Cross and Perry	**East.**
22	Pittsburgh ...	Between Cross and Perry	**West.**
23	Cross	Corner of Orange	**North.**
24	Hamilton	Corner of Wood	**South.**
25	Hamilton	Corner of Depot	**South.**
26	Hamilton	Corner of Williams	**North.**
27	Lake	Corner of Depot	**North.**
28	Lake	Corner of Williams	**North.**
29	Lake	Corner of Case avenue	**South.**
30	Bond	Corner of Hamilton	**East.**
31	Vestry	Corner of York	**South.**
32	Perry	Between Sibley and Cedar	**West.**
33	Perry	Corner of Scovill	**East.**
34	Perry	Between Scovill and Kinsman	**West.**
35	Granger	Between Prospect and Garden	**East.**
36	Kinsman	Between Perry and Irving	**West.**
37	Kinsman	Corner of Henry	**East.**
38	Lorain	Corner of Hicks	**North.**
39	Lorain	Corner of Columbus	**South.**
40	Bolivar	Corner of Miami	**South.**
41	River	etween Superior and St. Clair	**West.**
42	Vineyard	Corner of Champlain	**East.**
43	Columbus	Opposite Winter	**East.**
44	Columbus	Corner of Leonard	**West.**
45	Columbus	Corner of Girard	**East.**
46	Columbus	Corner of Merwin	**West.**
47	Meadow	Between Front and Lighthouse	**West.**
48	Rockwell	West street of Park	**West.**
49	Euclid	West street of Park	**South.**

In Kinsman street the hydrants were placed too close, and two have been taken out and set in Ohio street, one corner of Miami and one opposite the Homeopathic College.

The street reservoirs Nos. 7, 26 and 29 were also connected, thus making the whole number of reservoirs supplied from the Water Works, 24 out of 43.

SCHEDULE D.

Showing the relative elevations in feet and decimals of the intersection of streets, above the established base, and the levels below top-water line of the reservoir.

Intersection of Streets.	Above Base	Bel'w top water level	Intersection of Streets.	Above Base	Bel'w top water level
Pearl and Detroit	95.29	59.71	Bank and Lake	72.48	82.52
Pearl and Church	101.95	53.05	Bank and St. Clair	75.95	79.05
Pearl and Franklin........	110.51	44.49	Bank and Superior	81.88	73.12
Pearl and Vestry	109.75	45.25	Seneca and Lake	72.11	82.89
Pearl and Jay	109.48	45.52	Seneca and St. Clair	76.18	78.82
Pearl and Bridge	109.10	45.90	Seneca and Superior	81.45	73.55
Pearl and Carroll	108.85	46.15	Ontario and Lake	72.32	83.68
Pearl and Lorain	108.35	46.65	Ontario and St. Clair	74.92	80.08
Pearl and Chatham	106.30	48.70	Ontario and Rockwell	78.10	76.90
Franklin and Kentucky...	111.20	43.80	Ontario and Euclid	89.00	66.00
Franklin and Duane	117.34	37.66	Ontario and Champlain ..	90.80	64.20
Franklin and State	120.91	34.09	Ontario and Michigan	93.10	61.90
Franklin and Franklin pl.	116.74	38.26	Ontario and Pittsburgh ..	91.24	63.76
Franklin and Pearl	110.51	44.49	Pittsburgh and Huron......	91.42	63.58
Vestry and Pearl	109.75	45.25	Pittsburgh and Bolivar	92.12	62.88
Vestry and York	108.70	46.30	Pittsburgh and Eagle	92.87	62.13
Lorain and Pearl	108.35	46.65	Pittsburgh and Ohio	94.23	60.77
Lorain and Hicks	111.50	43.50	Pittsburgh and Cross	101.37	53.63
Lorain and Columbus	105.60	49.40	Pittsburgh and Perry	109.14	45.86
Lorain and Tracy	109.85	45.15	Kinsman and Eagle	91.03	63.97
River and Front	1.47	153.53	Kinsman and Ohio	94.47	60.53
River and Lighthouse.....	3.75	151.25	Kinsman and Cross	99.77	55.23
River and St. Clair	17.25	137.75	Kinsman and Burnham	102.47	52.53
River and Superior	18.49	136.60	Kinsman and Vine	102.27	52.63
Meadow and Front	2.13	152.87	Kinsman and Harmon	101.73	53.27
Meadow and Lighthouse..	9.95	145.05	Kinsman and Perry	101.73	53.27
Lighthouse and Spring....	18.44	136.56	Kinsman and Irving	102.00	53.00
Merwin and Superior......	18.25	136.75	Kinsman and Jackson	102.12	52.88
Merwin and James	15.50	139.50	Wood and Lake	73.00	82.00
Merwin and West	7.00	148.00	Wood and Hamilton	74.23	80.77
Merwin and Centre	3.90	151.10	Wood and St. Clair	74.95	80.05
Merwin and German	2.48	152.52	Erie and Lake	70.58	84.42
Merwin and French	2.45	152.55	Erie and Hamilton	71.64	83.36
Merwin and British	3.63	151.37	Erie and St. Clair	73.95	81.05
Merwin and Columbus ..	20.20	134.80	Erie and Oregon	74.59	80.41
Water and Lake	74.88	80.12	Erie and Superior	75.50	79.50
Water and Mandrake	75.35	79.65	Erie and Euclid	86.95	68.05
Water and St. Clair	75.03	79.97	Erie and Prospect	94.05	60.95
Water and Superior	72.50	82.50	Erie and Bolivar	95.36	59.64
Columbus and Centre	7.60	147.40	Erie and Eagle	94.95	60.05
Columbus and Winter	7.00	148.00	Erie and Kinsman	100.00	55.00
Columbus and Leonard ..	6.00	149.00	Depot and Lake	53.93	101.07
Columbus and Girard	7.30	147.70	Depot and Hamilton	56.23	98.77
Columbus and Merwin	20.20	134.80	Depot and St. Clair	57.63	97.37
Vineyard and Superior....	71.50	83.50	Sterling av. and Hamilton..	56.78	98.22
Vineyard and Long	58.00	97.00	Sterling av. and St. Clair...	57.17	97.83
Vineyard and James	26.65	128.35	Williams and Lake	53.80	101.20
Vineyard and Champlain..	25.70	129.30	Williams and Hamilton	54.60	100.40
Vineyard and West	14.80	140.20	Williams and St. Clair	54.38	100.62
Vineyard and Centre ...	13.40	141.60	Cheshire and Prospect	95.00	60.00

SCHEDULE D—Continued.

Intersection of Streets.	Above Base	Bel'w top water level	Intersection of Streets.	Above Base	Bel'w top water level
Cheshire and Garden	93.43	61.57	Rockwell and Bond	74.81	80.19
Granger and Prospect	95.42	59.58	Rockwell and Erie	74.91	80.09
Granger and Garsden	93.65	61.35	Superior and River	18.40	136.60
Perry and Euclid	88.62	66.38	Superior and Union	62.40	92.60
Perry and Prospect	94.63	60.37	Superior and Water	72.50	82.50
Perry and Cedar	95.37	59.63	Superior and Vineyard	73.32	81.68
Perry and Garden	94.50	60.50	Superior and Bank	81.88	73.12
Perry and Scovill	100.66	54.34	Superior and Seneca	81.45	73.55
Perry and Kinsman	102.47	52.53	Superior and Wood	78.65	76.35
Lake and Water	74.88	80.12	Superior and Bond	76.60	78.40
Lake and Bank	72.48	82.52	Superior and Erie	75.50	79.50
Lake and Seneca	72.11	82.89	Champlain and Vineyard	25.70	129.30
Lake and Ontario	72.32	82.68	Champlain and Canal	27.40	127.60
Lake and Wood	72.74	82.26	Centre and Vineyard	13.40	141.60
Lake and Bond	71.90	83.10	Centre and Columbus	7.60	147.40
Lake and Erie	70.58	84.42	Centre and Summer	5.60	149.40
Lake and Depot	53.93	101.07	Centre and Merwin	3.90	151.10
Lake and Williams	53.80	101.20	Euclid and west line of Sq.	88.84	66.16
Lake and Case avenue	52.50	102.50	Euclid and east line of Sq.	89.50	65.50
Hamilton and Wood	74.22	80.78	Euclid and Sheriff	88.83	66.17
Hamilton and Bond	72.51	82.49	Euclid and Erie	86.95	68.05
Hamilton and Erie	71.78	83.22	Euclid and Muirson	87.54	67.46
Hamilton and Depot	56.23	98.77	Euclid and Brownell	86.74	68.26
Hamilton and Sterling av.	56.78	98.22	Euclid and Dodge	86.50	68.50
Hamilton and Williams	54.60	100.40	Euclid and Huntington	86.38	68.62
Mandrake and Water	75.35	79.65	Euclid and Perry	88.62	66.38
Mandrake, w. end of same	76.50	78.50	Euclid and Hudson	87.00	68.00
St. Clair and River	17.25	137.75	Euclid and Case avenue	88.50	66.50
St. Clair and Water	75.00	80.00	Euclid and Park	92.00	63.00
St. Clair and Bank	75.95	79.05	Prospect and Ontario	93.15	61.85
St. Clair and Seneca	76.18	78.82	Prospect and Sheriff	94.33	60.67
St. lCair and Ontario	74.92	80.08	Prospect and Erie	94.05	60.95
St. Clair and Wood	74.95	80.05	Prospect and Brownell	94.88	60.12
St. Clair and Bond	74.31	80.69	Prospect and Huntington	94.61	60.39
St. Clair and Erie	73.95	81.05	Prospect and Cheshire	95.00	60.00
St. Clair and Muirson	66.30	88.70	Prospect and Granger	95.42	59.58
St. Clair and Clinton	65.00	90.00	Prospect and Perry	93.95	61.05
St. Clair and Marshall	63.00	92.00	Prospect and Hudson	93.95	61.05
St. Clair and Perry	60.80	94.20	Eagle and Kinsman	91.03	63.97
St. Clair and Minnesota	57.50	97.50	Eagle and Erie	94.95	60.05
St. Clair and Alabama	56.50	98.50	Huron and Pittsburgh	91.42	63.58
St. Clair and Delaware	58.00	97.00	Huron and Miami	95.93	59.07
St. Clair and Sterling av.	56.70	98.30	Huron and Erie	94.10	60.90
St. Clair and Waring	55.70	99.30	Bolivar and Pittsburgh	92.12	62.88
St. Clair and Rossiter	55.20	99.80	Bolivar and Miami	94.58	60.42
St. Clair and Lawrence	55.90	99.10	Bolivar and Erie	95.36	59.64
St. Clair and Phelps	55.70	99.30	Ohio and Kinsman	94.47	60.53
St. Clair and Merchant	55.30	99.70	Ohio and Pittsburgh	94.23	60.77
St. Clair and Williams	55.00	100.00	Ohio and Miami	92.57	62.43
Rockwell and Ontario	77.85	77.15	Cross and Orange	101.90	53.10
Rockwell and Wood	76.61	78.39	Cross and Pittsburgh	101.37	53.63

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ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1860.

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REPORT

OF THE

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OF

WATER WORKS

OF THE

CITY OF CLEVELAND

For the Year 1860.

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REPORT

OF THE

TRUSTEES OF WATER WORKS.

To the Honorable City Council of Cleveland:

The Trustees of Water Works herewith submit the annual report of the Superintendent and Engineer, and of the Secretary for the fiscal year ending Dec. 31, 1860, which exhibit the condition of the Works, and the operations of their several departments during that period. The gross receipt for water, $16,683.60; expenses, $9,418.18; net receipts, $7,375.42. This shows an income of net receipts, over the year 1859, of $2,174.16. There has been laid the past year 5,134 feet of distributing pipe, and 6 new fire hydrants have been constructed. The total number of feet of distributing pipe now laid, and in use, is 124,276 feet, equal to 23.536 miles. The whole number of fire hydrants in use at the end of the year is 138; in addition to this there are now 49 street reservoirs, 25 of which are supplied with water from the Water Works.

The total number of gallons of water distributed during the year is 260,220,354. The number of gallons per day, 710,984. The number of gallons to each inhabitant 14.11, and to each consumer 101.57.

There has not been so large an increase of water takers the past year as was hoped for; this has arisen, we think, mainly from the depressed state of business generally prevailing in our city, which has compelled a large proportion of our population to dispense with whatever is not strictly a necessity. With the resumption of an active business and a consequent more general prosperity, we think we may reasonably expect a large increase of water takers, and a proportionate enhancement of our revenue.

As your Honorable Body has been frequently urged the past year to procure an analysis of the water furnished our citizens, we have thought perhaps it might be a matter of some interest to republish the analysis of our lake water, made by Professor W. W. Mather, of Columbus, O., for the Committee on Water Works, in the year 1852.

An examination of this report will show that the water of Lake Erie, which is now furnished our citizens, was at that time as pure and as good as that furnished any city, and we presume has not essentially changed in its character.

This analysis was made with great care by a person admitted to be eminently qualified for the undertaking, and we think may be considered as entirely reliable. The Trustees, therefore, cannot see the necessity of a new analysis.

In submitting the reports of the Engineer and Secretary, the Trustees, while approving the same as to most of the suggestions made, must dissent from their conclusions as to the advisability or equity of raising revenue indicated by them severally; but, in so doing, they do not desire to be understood as claiming for the present system perfection, or that it is not susceptible of great improvement.

The general impression (that the present mode is not equitable) which has obtained throughout the community, and which has attracted the attention of the Council insomuch that it has been made matter of reference to this board, demands from us the most careful scrutiny of the entire subject, and has been the subject of investigation for a long period without our coming to a satisfactory conclusion or devising a system free from objections, and which we were sure would approximate more nearly to equity than the present mode. In discussing the subject, the general proposition is assumed that in proportion to the benefits conferred upon the property within the entire limits of the corporation should rest the burthen of taxation for construction and maintenance of this great work. Upon this hypothesis it is fair to presume the originators of the scheme and the people who voted for the construction of the same assumed that all property in the city would participate in the general benefits to be derived therefrom in its sanitary effects upon the population, in security against extensive fires, in the comfort of street sprinkling, and in the enhanced value of property, consequent upon the convenience, and to the extent that the interest upon the debt should be cheerfully borne by taxation upon the general duplicate until the enterprise should be self-sustaining from water rents. The general revulsion in business, and variouos circumstances, indicate that the period when it was hoped they would become so, is deferred.

It does not, therefore, appear that this burthen, voluntarily assumed, should be entirely cast off, but it is deemed just that this burthen should be equalized so as to impose the burthen more in proportion to the benefits conferred. It is apparent that all property and every person in the city participate in these general benefits not alike in degree, for the reason that some portions of the city are not exposed to equal hazards from extensive fires which pertain to other portions, nor do city lots, remote from the line of distribution pipes, participate to the same extent in the incidental protection from fire thereby; and the enhanced value of property which is common to those immediately on the line of distribution, nor do the benefits of this enterprise accrue in an equal degree to real and personal property, especially investments in merchandise. We are to deal with things as they exist; the basis of taxation is the real and personal property upon the tax duplicate; to exempt any portion of this property entirely from taxation, which would be the case if we limit our revenue to special tax upon the property, or rather real estate, along the line of distributing pipes, would be manifestly unjust. How, then, shall we apportion this burthen to approximate the nearest to equity?

Suppose, to illustrate, we levy upon the general duplicate—

40 per cent of the entire revenue to be raised,

30 per cent by levy of special tax upon the property bounding and abutting on streets through which distributing pipes are laid,

30 per cent upon those supplied with water by connecting with pipes,

Assuming as a basis for annual expenditure

Interest on Water Works bonds		$38,000 00
Running expense and repairs necessary to be raised		10,000 00
		$48,000 00
40 per cent by levy on general duplicate	$19.200 00	
30 per cent by special tax	14,400 00	
30 per cent by Water Works	14,400 00	
		$48,000 00

The present water rents are about $16,000.00; therefore, this estimate will permit a reduction of 10 per cent on water tariff, and thus furnish an incentive to persons on the line of distributing pipes to connect therewith, and thus increase revenue.

All of which is respectfully submitted,

SAMUEL F. LESTER,
WM. B. CASTLE,
PETER THATCHER.

Report of the Secretary.

To the Trustees of the City Water Works:

Gentlemen:—I herewith submit to you a statement showing the receipts and expenditures of money on account of the Water Works for the year 1860.

The receipts for water, over running expenses and repairs, amount to seven thousand three hundred seventy-four dollars and forty-two cents ($7,375.42), showing a gain over receipts of 1859 of two thousand one hundred seventy-four dollars and sixteen cents ($2,174.16), whilst the running expenses and repairs for 1860 are in excess of 1859 only seven hundred ninety-four dollars and fifty-five cents ($794.55).

The interest on Water Works bonds amounts to thirty-eight thousand dollars ($38,000) per annum. The interest for 1860, over net receipts for water, exceeds thirty thousand dollars ($30,000), which was raised by taxation.

An experience of four years and a half I think a sufficient time to satisfy us that the present mode of assessing water rents is not the proper one to enable the Trustees to pay the interest on the debt.

The property on the line of the water pipe should be assessed to the amount of the benefit thereto, whether the water is taken or not. It seems unjust that the people who are not directly benefited, and who cannot have the water, should pay as much tax on the water debt as those who are directly benefited and who could take the water if they would. A tax on the foot front of all land abutting on the water-pipe, in addition to an assessment of the premises thereon, would give revenue nearly sufficient to pay the interest on the debt. The figures would show something like the following result:

We have laid say twenty miles of pipe, taking out for street crossings. Now, we will suppose that five miles or one-fourth of this distance is vacant ground:

Five miles, equal to 26,400 feet, at 5 cents per lineal foot on each side of the street, making 10 cents, would give $2,640.

Fifteen miles, equal to 79,200 feet, at 10 cents per lineal foot on each side of the street, making 20 cents, would give $15,840.

The water rent this year, according to the present water tariff, amounts to $16,793.60. Make a new tariff, reducing the present rates 50 per cent, and it will give.............. $8.396

Making a total water rent of.....................$26,876

Which does not include the buildings that would be assessed on the line of water-pipe, in addition to those already assessed.

I offer these suggestions in hopes some plan may be devised whereby a better showing may be made of the result of the operations of our Water Works, which, in their construction, are not excelled by any in the country, and as to Lake Erie water it need only be used to be appreciated.

Respectfully submitted,

GEO. W. GIRTY, Secretary.

Water Works Office, Cleveland, Jan. 1, 1861.

STATEMENT

Of the Receipts and Expenditures of money received for Water for the year 1860, on account of the Cleveland Water Works, as per Monthly Statements submitted to the City Council.

EXPENDITURES.			RECEIPTS.	
January		$ 521 22	January	$ 1,196 63
February		488 62	February	485 06
March		703 22	March	1,354 05
April		737 98	April	1,595 12
May		697 59	May	1,982 86
June		1,155 10	June	1,711 93
July		723 68	July	1,607 25
August		1,022 77	August	768 84
September		577 11	September	1,574 08
October		646 88	October	1,496 15
November		1,262 22	November	1,751 22
December		1,051 51	December	1,464 47
		$9,587 90		$16,987 66
Deduct amount credited:			Deduct water rent returned	194 06
Running expenses	$ 25 50			
Repairs	144 22		Receipts, 1860	$16,793 60
		169 72		
				$ 9,418 18
Running expenses and repairs, 1860		$ 9,418 18	Receipts over expenses, 1860	$ 7,375 42

CASH ACCOUNT, 1860.

Cash on hand January 1st, 1860, as per Report			$ 361 40
Cash received for water		$16,987 66	
Deduct running expenses	$ 7,683 80		
Deduct repairs	1,734 38		
Deduct returned water rent	194 06		
		9,612 24	
			7,375 42
Cash received for Exchange on New York			6 00
Cash received from City of Cleveland, balance of account			477 53
Cash received on account "Construction Fund" for old brass, scrap-iron, etc.			76 97

Cash received from "Ocean Bank," New York		1,200 00
Cash received from the City to pay interest on water bonds due in New York, June	$18,550 00	
Due in New York, December	18,500 00	
And interest on bonds unsold	900 00	
		38,000 00
		$47,497 32
Cash paid for pipe extension		$ 3,830 83
Cash paid J. Ball & Co.		43 68
Cash paid S. M. Carpenter & Co., balance due		1,726 92
Cash paid Jos. Perkins		78 75
Cash paid The Ocean Bank, New York	$ 17 50	
	592 50	
		610 00
Cash paid for interest and exchange		6 07
Cash paid on account "Construction Fund":—		
For trees at reservoir	$ 187 00	
For railing at reservoir and painting do	128 81	
For drain pipe at engine house	39 05	
		354 86
Cash paid interest on water bonds	$36,910 00	
Less this amount paid out of funds remitted December, 1859	18,392 50	
		18,517 50
Cash remitted December, 1860, to the Ocean Bank, New York, to be applied as follows:		
To pay interest on Water Bonds, falling due January 1st, 1861	$18,550 00	
To be placed to our credit, being interest received on Water Bonds unsold	450 00	
		19,000 00
Cash balance to our credit in the Ocean Bank previous to the credit of the above $450.00		482 50
Cash on hand January 1st, 1861		2,846 21
		$47,497 32

LEDGER BALANCES, JANUARY, 1861.

DEBITS.		CREDITS.	
Cash	$ 2,846 21	Water rents	$9,062 58
Construction Fund	2,631 41	Coupons	18,955 90
Pipe extension	36,746 55	Interest and exchange	1,645 69
Ocean Bank, coupons	19,482 50	Bonds	35,000 00
Bills receivable	250 00		
Commissions	58 75		
Discount	2,570 00		
Jos. Perkins	78 75		
	$64,664 17		$64,664 17

ASSETS.		LIABILITIES.	
Cash on hand	$ 2,846 21	Coupons unpaid, 1859	$ 215 90
Bonds unsold	15,000 00	Coupons unpaid, 1860	190 00
Bills receivable	250 00		
	$18,096 21		$ 405 90

REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, Jan. 1, 1861.

To the Trustees of Water Works:

Gentlemen:—The undersigned presents herewith his annual report upon the condition of the City Water Works, for the year ending December 31, 1860, being the fifth since the introduction of the water of Lake Erie into the city.

It is thought best not to deviate from the general arrangement of the reports of former years, treating the different parts of the works separately, and in their natural succession, from the source of supply to the delivery of this pure and salubrious article to the consumers.

I. LAKEWORK AND AQUEDUCT.

, During the past year, the inlet tower and pipe were several times closely examined, and found in perfect condition. It is, however, advisable to finish the protection on the shore of the lake, and to erect the gate-house at the connection between the inlet pipe and the aqueduct, at an early period, to be enabled to empty the aqueduct, should occasion require this to be done.

The aqueduct is in good order. It will only be required during the ensuing year to fill up some low places, over this conduit, which have settled again since the filling in 1857, and to repair the drains which convey the spring and rain water from the hillside across the aqueduct, to the old river bed. These two items should not be delayed, as it is all important for the safety of this structure to prevent the softening of the treacherous and yielding ground upon which the aqueduct is built. A small sum judiciously expended, will keep this part of the Works in good order.

II. ENGINE HOUSE.

During the past season, the tower, the roofs, and the outside of doors and windows were painted, and the whole is now in good condition. At all events, it would be no unwise expenditure to paint, the coming year, the inside woodwork, and the engines also. At the same time, the spiral staircase, leading from the engine house floor to the steamchest floor, ought to be extended to the beam floor. So far, the enginemen had access to the upper floor by ladder, which, only abstractedly, from its unsightly appearance, is not a safe way for ascending or descending, with heavy tools or other implements, that have to be carried from one floor to the other.

The brick pavement in the boiler-rooms is worn out, and it often happens that pieces of brick are thrown upon the grates of the boilers, with the coal, whereby the grate-bars are injured; and furthermore, on account of the unevenness of the floors, they cannot be kept clean. It is therefore earnestly recommended to substitute good smooth flagging for these brick floors, and to extend the same in the roadway, from the boiler-rooms to the coal bins.

A further desideratum are stationary stairs, leading from the engine house floor into the boiler rooms.

By your order the engine house lot was graded, and partly filled up with the material dredged from the old river bed; the newly laid out roadways were filled up with ashes and cinders, and the fences straightened and repaired.

The spaces around the engine house, from the walls to the roadways being made sloping, to exclude dampness from the house, should be turfed, to prevent the washing of the earth therefrom.

It is contemplated to plant willows along and close to the east and west line ot the lot; to have well-grown hedges by the time the present board fences will be decayed; the same to be done at the shore of the old river bed, on both sides of the dock, to protect the land against washing.

It will be necessary to re-plank the dock next year, as many of the old planks are rotten, and quite unsafe for teaming the coal from the dock to the bins.

The building of a new privy is very much needed, as the present one is made of rough boards only, and very much dilapidated.

III. ENGINES AND BOILERS.

The pumping machinery and appurtenances are in perfect running order. All the repairs required, last year, were new stems for the steam valve of the west engine, the old ones being worn on one side, which prevented the steam-tight packing of the same.

The East engine has run	999 hours 20 min.
The East engine has run	811 hours 45 min.
Total running time during the year	1,811 hours 5 min.
Average running time per day, 6 hours, having run	303 days
Number of strokes of East engine	455,318
Number of strokes of West engine	361,983
Average height above surface of lake at which the water was delivered	156.5 ft.
Average duty of East engine	50,500,000 lbs.
Average duty of West engine	50,000,000 lbs.

of water, raised one foot high, with every 100 lbs. of coal consumed.

In calculating the duty of the engines, the Cornish formula has been retained, not only for the purpose of comparing with former years, but also for furnishing a more direct comparison with the duty performed at other Water Works, this formula being now generally used.

In this calculation is included the entire quantity of fuel consumed, both for raising steam and running. In regard to the duty, due allowance should be made for the fact, that while the engines were running only six hours per day, during the intervals of stopping and starting, the furnaces became each day comparatively cold, and therefore a large percentage of fuel was consumed for reheating the furnace every morning, and that slack was used altogether for fuel. The pure Mineral Ridge slack, used during the year, compares very favorably with others, and it is recommended to continue the use of screenings next year.

IV. RESERVOIR.

This part of the works is in satisfactory preservation. The railing on both sides of the flight of steps leading to the top, is appreciated by all visitors, and particularly the fairer part is expressing their gratitude for this improvement very freely. The evergreens which were planted on the sides of the walks on the reservoir grounds, beautify the whole, to a large extent, and in a few years will give a very pleasant, inviting shade to the many visitors who frequent the place constantly.

It is confidently expected that the scholars of the adjoining high school will share, for the future, the pride of their parents and the community in general, of being enabled to bring friends and strangers to such a beautiful place of public resort, and will emulate the efforts of those in charge of this institution, by ceasing to do mischief to the place.

The waste pipe, from the reservoir, leads down Kentucky street to Washington street. This line of pipe should be extended to the engine house lot, where connections with both boiler rooms would be of great advantage to the Works. A plan illustrative of this proposition will be submitted to you in due time, and its prominent advantages explained.

V. DISTRIBUTION.

All pipes and appurtenances are in good order. During the past year, one serious break occurred in the night of October 1, at which time the chamber of the twenty-inch valve, in West River street, near the crossing of the main pipe, under the river, burst, and in consequence the supply had to be shut off from the city for one night and one day. No other repairs, of any consequence, were required.

A second main, crossing the river, on some other suitable place, would secure an uninterrupted supply, in case of the recurrence of a similar accident, and this suggestion is earnestly recommended to your consideration.

The proposition of last year, for a safer tunnel for the twenty-inch main, on both sides of the canal, on West River street, is again recommended, at the same time submitting the suggestion of raising the pipe to the usual depth the water pipes are laid, whereby all difficulties in making repairs would be obviated forever.

The transfer of the east side public fountain, from the center of the Park, into the northwest corner, and the erection of Com. Perry's monument on the former place, caused some alteration in the pipes crossing the Park. The four-inch line from the Bennett house to the postoffice, was taken up, as it would never be required for any service, and the eight-inch line, supplying Ontario street, was laid so that it passes round the west side of the foundation of the monument.

The following table exhibits all the water pipes laid to Dec. 31, 1860:

Diameter in inches	24	20	16	10	8	6	4	3	2
Pipes laid previously to 1860	2,668	10,678	2,608	5,205	11,163	20.009	61,950	4.413	448
Pipes laid in 1860							5,223	122	346
Total	2,668	10,678	2,608	5,205	11,163	20,009	67,773	4,535	794
Pipes taken up in 1860........							557		
Balance	2,668	10,678	2,608	5,205	11,163	20,009	66,616	4,535	794
		15,954 feet.				108,322 feet.			

15,954 feet, or 3.021 miles of main pipes.
108,322 feet, or 20.515 miles of distributing pipes.

124,276 feet, or 23.536 miles in total.

Which shows an increase, over the previous year, of 5,135 feet, or nearly one mile.

Appendix A, shows the extension of water pipes in 1860, more specific.

Appendix B, gives the number and location of the stop valves set during the year.

In connection with this pipe extension, six additional fire plugs were set, making the whole number of fire plugs in use at the end of the year, 138. In addition to these fire plugs, there are now 49 street reservoirs (6 having been built during the past year), 25 of the whole number are now supplied with water from the Water Works.

The location of these fire plugs and street reservoirs are given in Appendix C.

Appendix D gives a detailed statement of the water distributed from the Works in each month of the year 1860, the average daily consumption and the average daily distribution for each inhabitant of the city.

It shows furthermore the number of gallons of water distributed in the different years, from 1857 to 1860, inclusively, the average daily consumption in these years, and the average daily distribution to each inhabitant of the city, during the same period.

The distribution to each inhabitant exhibits quite a small consumption in comparison with other cities; but, as the number of our water takers is very limited—comprising about one-seventh of the whole population—the quantity is more than liberal, for each actual consumer, being over 100 gallons per day.

The almost unlimited use of the water for sprinkling purposes, and the extensive appropriation of water by persons not entitled to its use, may account for this excessive consumption.

It is highly recommended to your deliberation to provide some means of making those suffer the penalty the law prescribes, who think it proper to use the water without permission or payment for the same.

In conformity with your order, a correspondence has been opened with Superintendents of other Water Works, and with manufacturers about the introduction of meters, and from the information received, it is thought proper to recommend the purchase of some meters, to be used at present chiefly on places where consumers are not satisfied with the assessment, and at such establishments where no basis for assessment can be obtained.

The daily experience at this office, demonstrates the necessity of a reassessment of all premises where water from these works is consumed, as since the introduction of the water many houses have been altered, or enlarged, but a change in the water rent was very seldom made, comparatively but a few of these alterations have been reported directly at this office.

The several changes of the tariff make a new assessment also most desirable, particularly as in the first three years the size of lots was not taken into account by assessing premises for the use of the water.

At the same time it is again recommended to take into consideration the devise of a way of assessment more equitable to the citizens in general, more beneficial to the works and not burdensome to the consumers of the water.

An experience of nearly five years demonstrates plainly that the voluntary system, the taking of water left optional with the owner of premises on the line of water pipes, will never make the works what they ought to be by this time, self-sustaining.

The interest on the Water Work's bonds was paid thus far by the city from the general fund, whereby citizens living miles off from the district of water pipes, pay at the same ratio as those having the water pipes passing in front of their houses.

The iniquity of this assessment is apparent, and it would be more just to let those alone pay who are really benefited by the establishment.

This interest of the bonds should, at least in part, be paid by a levy on the front foot of all taxable property in streets where water pipes are laid.

Going into a more specific calculation, the following figures will illustrate the idea plainly:

We have, say 20 miles of distributing pipes, wherefrom about one-fourth is to be deducted for intersections of street, etc., which leaves, for both sides of the streets, 30 miles of taxable front, equal to 158,400 feet upon which could be levied.

The interest, amounting to $38,000.00, to be paid entirely by this special tax, would, at our present limited extension of distributing mains, require a levy of 24 cents per front foot, and as such a tax would be rather heavy, it is suggested to raise half the interest, or $19,000, in this way by special tax of 12 cents per lineal foot. This assessment is almost equal to that at Cincinnati, and lower than in eastern cities.

The balance of the interest with $19,000.00, the running expenses estimated at $8,000.00 and the repair expenses at $2,000.00, or in total, $29,000.00, to be raised by water rents.

At present not more than about half the houses on the line of water pipes are supplied with water, the other half reaping the full benefit of the Water Works through protection against fire, etc., without paying one farthing towards the sustenance of the institution.

Our voluntary customers are paying an annual water rent of over $16,000.00, should therefore the owners of the other houses be obliged to pay water rent also, whether they take the water or not, the deficiency of $13,000.00 could be collected from such an assessment.

Should you favor the proposition of expending the money on hand for the purpose of making further extensions, the result would be that about $5,000.00 more revenue could be raised by the proposed special tax of 12 cents per foot, and the tariff of water rents could be reduced at the same rate.

As soon as the Works are in possession of 30 miles of distributing pipes, the entire interest could be raised by the levy of special tax, and the water rates could be reduced so far as to be sufficient only to pay running expenses and repair, which would then require about 30 per cent of the present tariff rates.

These remarks are intended only as suggestions; as it may be that a more simple or a more efficient way to insure the self-sustainance of the works, can be designed.

At all events, there can be no harm in collecting material for the establishment of a more equitable basis of raising a revenue sufficient to pay all liabilities of the works from their own income.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer.

APPENDIX A.

Showing the extension of Water Pipes during the year 1860.

Diameter of Pipes in Inches	IN WHAT STREET.	BETWEEN WHAT STREETS.	FEET LAID	TOTAL	REMARKS.
4	Sheriff	Euclid and Prospect	516	....	**Cast iron pipes.**
4	Michigan	Ontario and Canal	937	....	**Cast iron pipes.**
4	N. Av. Park.	West avenue and Ontario	235	....	**Cast iron pipes.**
4	Seneca	Crossing Superior	74	....	**Cast iron pipes.**
4	E. Av. Park..	Superior and Euclid	310	....	**Cast iron pipes.**
4	Leonard	Columbus and Voltaire	344	....	**Cast iron pipes.**
4	Brownell	Lake and St. Clair	580	....	**Iron & cement pipe.**
4	Cedar	Perry and Greenwood	1,030	....	**Iron & cement pipe.**
4	Hamilton	Erie and Brownell	1,197	....	**Iron & cement pipe.**
	Total	....		5,223	
3	Michigan	Corner of Seneca	30	....	**Fire-plug conn.**
3	Leonard	Columbus and Voltaire	27	....	**Fire-plug conn.**
3	Brownell	Corner of Lake	246	....	**Fire-plug conn.**
3	Cedar	Perry and St. Charles	176	....	**Fire-plug conn.**
3	Cedar	Corner St. Charles	3	....	**Cistern connect.**
3	Hamilton	Corner St. Charles	10	....	**Fire-plug conn.**
3	Hamilton	Corner of Brownell	10	....	**Fire-plug conn.**
	Total	....	....	122	
2	W'm's alley..	St. Clair and Lake	346	....	**Iron & cement.**
	Total	....	....	346	
		Total of pipes laid in 1860..............	....	5,692	
		Therefrom has to be deducted the 4-inch pipe taken up in the Park,		557	
		leaves an extension of	....	5,134	**Feet.**

APPENDIX B.

Showing the number and location of stop valves used in the Year 1860.

Number.	Waterway in Inches.	LOCATION	
		Street.	Side of Street.
1	6	Euclid	East line of Sheriff.
1	6	inch Valve.	
1	4	Sheriff	South line of Euclid.
1	4	Sheriff	North line of Prospect.
1	4	Michigan	West line of Ontario.
1	4	Michigan	West line of Seneca.
1	4	Seneca	South line of Superior.
1	4	East Avenue of Park	South line of Park.
1	4	Leonard	East line of Columbus.
1	4	Brownell	South line of Lake.
1	4	Cedar	East line of Perry.
1	4	Cedar	West line of St. Charles.
1	4	Hamilton	East line of Erie.
1	4	Hamilton	West line of Muirson.
1	4	Hamilton	West line of Brownell.
13	4	inch Valves.	
1	2	Williams alley	North line of St. Clair.
1	2	inch Valve.	

In taking up the line of 4-inch pipes, in the park, two 4-inch valves had to come out also, one on the west line of the park, and the other in the park, on the east line of Ontario street. The former was placed in Superior street, on the west line of West avenue, and the latter in Superior street, on the east line of East avenue.

APPENDIX C.

Giving Number and Location of Fire Plugs and Street Cisterns Added to the Former Ones, During the Year 1860.

No.	STREET.	LOCATION.	SIDE OF ST.
1	Michigan	Corner of Seneca	South.
1	Brownell	Corner of Lake	East.
1	Cedar	Between Perry and St. Charles	North.
1	Leonard	Between Columbus and Voltaire	West.
1	Hamilton	Corner of Second alley	North.
1	Hamilton	Corner of Brownell	North.
6	Fire-plugs in Total.		

The street reservoir No. 40, at the intersection of Cedar and St. [illegible] street, was also connected with the water pipes, making the number [illegible] nected street reservoirs 25 out of 49.

APPENDIX D.

Showing the Distribution of Water in 1860.

Month.	Gallons Distributed.		Distributed for each Inhabitant Per Day.		Distributed for each Consumer Per Day.	
	Per Month.	Per Day.	Gall.	Dec.	Gall.	Dec.
January	15,272,904	492,672	8	85	70	38
February	14,741,844	508,339	10	15	72	62
March	18,001,298	580,654	11	61	82	95
April	14,224,776	474,159	9	48	67	72
May	23,433,738	755,927	15	12	107	99
June	27,420,186	914,006	18	28	130	55
July	28,968,846	934,479	18	69	133	49
August	27,862,206	898,780	17	97	128	39
September	25,620,306	854,010	17	08	122	00
October	24,551,554	791,985	15	84	113	14
November	19,722,042	657,401	13	15	93	91
December	20,400,654	658,085	13	16	94	01
Total	260,220,354	710,984	14	11	101	57

Showing the Distribution in the Different Years, from 1857 to 1860.

Year.	Total Consum'n Per Year.	Av'g Consu'n Per Day.	Each Inhabitant per day.		Each Consumer Per Day.	
			Gall.	Dec.	Gall.	Dec.
1857	127,262,265	348,664	7	75	110	68
1858	142,155,434	389,467	8	37	93	44
1859	198,234,090	543,107	11	31	91	27
1860	260,220,354	710,984	14	11	101	57
Total in 4 yrs....	727,872,143	498,055	10	38	99	24

173705

ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1861.

173705

REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

For the Year 1861.

173705

ANNUAL REPORT

OF THE

Trustees of Water Works,

For the Year Ending Dec. 31st, 1861.

To the Honorable Mayor and Common Council of the City of Cleveland:

The Trustees of Water Works herewith submit the annual report of the Engineer and Superintendent, which exhibits the condition of the Works, and the operations in his department during the past year.

The accompanying abstract from the Secretary's books shows the receipts and expenditures during the year.

All of which is respectfully submitted,

SAMUEL F. LESTER,
WM. B. CASTLE,
P. THATCHER, JR.,
Trustees.

Office of Water Works, Cleveland, April 7, 1862.

SECRETARY'S REPORT.

To the Trustees of the City Water Works:

Gentlemen:—I herewith submit to you a statement showing the receipts and expenditures of money on account of the Water Works, for the year 1861.

STATEMENT OF THE MONTHLY RECEIPTS AS SUBMITTED TO THE CITY COUNCIL.

EXPENDITURES.		RECEIPTS.	
January	$ 689 67	January	$ 1,242 45
February	578 97	February	556 26
March	631 92	March	1,376 33
April	540 58	April	1,635 38
May	972 80	May	1,921.65
June	938 73	June	1,596 42
July	948 01	July	1,558 51
August	1,048 84	August	811 09
September	733 88	September	1.580 32
October	872 57	October	1.584 31
November	726 07	November	1,923 25
December	766 62	December	1,589 94
	$ 9,448 66		$17,375 91

ADDITIONAL RECEIPTS.

Account running expenses	$ 10 00
Account repairs	32 00
Account ferrules	9 00
	$17,427 31
	9,448 66
Net receipts for 1861	$ 7.978 65
Net receipts for 1861, over 1860	603 23

CASH ACCOUNT, 1861.

Cash on hand January 1st, 1861, as per Report			$ 2,846 21
Cash received for water		$17,384 91	
Deduct running expenses	$ 7,768 36		
Deduct repairs	1.350 84		
Deduct returned water rent	287 06		
		9.406 26	7.978 65
Cash received from the City to pay interest on bonds due in New York		$37.100 00	
Interest on bonds unsold		900 00	
			$38,000 00
Cash received for scrap iron and old rope			19 57
Cash received of Joseph Perkins			153 59
Cash received for interest and exchange			5 92
Cash received on bills receivable			90 00
			$49,093 94

Cash paid interest on water bonds	$37,097 50
Cash paid the estate of the late Jacob Perkins, for damages to lots on the West Side	153 59
Cash paid for labor, etc., on engine house lot	83 40
Cash paid the Cuyahoga Steam Furnace Co.'s bill, repairs and labor on account Construction Fund	67 32
Cash paid for pipe extension	3,443 13
Cash paid Joseph Perkins	61 50
Cash paid the Ocean Bank, New York	119 42
Cash on hand, January 1, 1862	8,068 08
	$49,093 94

LEDGER BALANCES, JANUARY, 1862.

DEBITS.		CREDITS.	
Cash	$ 8,068 08	Water rent	$17,041 23
Construction Fund	2,916 15	Coupons	408 40
Pipe extension	40,189 68	Jos. Perkins	13 34
Ocean Bank	601 92	Interest and exchange	2,101 61
Bills receivable	160 00	Bonds	35,000 00
Commissions	58 75		
Discount	2,570 00		
	$54,564 58		$54,564 58

Respectfully submitted,
GEO. W. GIRTY, Secretary.

Water Works Office, Cleveland, Jan. 1, 1862.

REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, Jan. 1, 1862.

To the Trustees of Water Works:

Gentlemen:—The undersigned presents herewith, his sixth annual report upon the operations and condition of the City Water Works, for the year ending December 31, 1861.

The condition of the several distinct parts of the works, you will please find under their respective heads, as follows:

I. INLET TOWER AND AQUEDUCT.

The condition of these parts is satisfactory.

Next year it will be necessary to empty the aqueduct, for inspection and eventual repairs. To be able to do this, the erection of the gate house and pumping engine at the lake shore, is absolutely required.

A permanent surface drainage of the land south of the line of aqueduct, conveying the spring and rain water across the aqueduct into the old river bed, should be established; to be secured against any accident from heavy rain storms, and to keep the earth over the aqueduct dry and solidified.

II. ENGINE HOUSE.

This building is generally in good condition.

The repairs of the floors in the boiler rooms, the continuation of the spiral stairs in the rear of the engines, and the building of stationary stairs from the engine house floor to the boiler rooms, are again recommended to your earnest consideration. The garret room of the engine house should be floored, and provided with some skylights; it is used as a store room for patterns, etc., and being entirely dark, it is unsafe to step from joist to joist and ventilating the room occasionally is desirable.

III. ENGINES AND BOILERS.

The lower pump valves were taken out, thoroughly overhauled and provided with new seats, different from the original ones. They work now better than ever before, and will not require any repairs for a long time. The stems of the steam valves on the East engine were renewed this year, and the whole pumping apparatus is now in a very satisfactory condition.

The East Engine has run 1,066 hours 45 minutes.
The West Engine has run 1,040 hours 50 minutes.

Total running time, 2,107 hours 35 minutes.

Having run 311 days during the year, the average running time per day was 6 hours 46½ minutes; an increase over last year of 46½ minutes per day.

Number of strokes of East Engine.........509,785
Number of strokes of West Engine........503,344
Average height above surface of lake at which the water was delivered ....156,432 ft.
Average duty of East Engine......55,000,000
Average duty of West Engine......49,000,000 pounds of water raised one foot high with every 100 lbs. of coal consumed.

In this calculation is included the entire quantity of fuel consumed, both for raising steam and pumping.

The use of slack coal as fuel was continued this year, and the article delivered under the contract (pure Chippewa) has given very satisfactory results.

IV. RESERVOIR.

With the exception of the valve-bridges and the brick pavement of the inside slope above the top water-line, this part of the works is in a desired state of preservation.

The ends of the beams of the bridges resting in the embankment are decayed; the tension-rods have no hold on this rotten end of the beams, and consequently the bridges have sunk in the middle. It will be sufficient to repair these bridges by cutting the decayed part of the beams off, and replacing them with new pieces, until the entire structures need to be renewed; at which period iron stringers ought to be substituted.

The quality of the bricks in Cleveland and vicinity is not adapted for exposure to constant washing from water and to ice. Every year a large quantity of bricks of the inside slope pavement has to be renewed; and it is therefore submitted to your consideration, to substitute a more durable material, either flagging or cast-iron plates.

V. DISTRIBUTION.

The whole system of main and distributing pipes is in good condition.

In last year's report, a serious break in the 20-inch main w
mentioned, and a second main, crossing the river at a diff
place, recommended.

The same accident occurred this year, and the city wa
deprived of the water for 36 hours.

With all the precautions that can be used, pipes a
are liable to burst,—injuries which might at any time
city to be deprived of water for 24 hours or more. Th

of breaks increases every year, and should such a casualty occur at the same time with a destructive conflagration, the consequences might be disastrous beyond the whole cost of the Water Works.

The recurrence of such accidents will not only be serious to the works, but our large consumers, such as railroad stations and large manufactories, depending for an uninterrupted supply of water entirely upon the Water Works, may become inclined to return to their old sources of supply, should this uncertainty of a steady supply exist much longer, and it may prejudice new establishments not to become water-takers. The sole remedy is the laying of another independent main, for which an entire different route is recommended, so that in case of any accident to one, the other may be used independently, and thereby the supply of water to our consumers kept uninterrupted.

A 16-inch main is already laid from the reservoir to Franklin place, and it is hereby proposed to extend this line along Franklin street to Columbus street, crossing it to West River street, following the track of the Mahoning Railroad to a point opposite Ohio street, then in a straight line (crossing the river and canal) along Ohio street to Erie street, and in Erie street northward to its intersection with Prospect street, to connect with the previously laid 16-inch main ending at that point.

This line is about 10,000 feet long. It would have the further advantage of a direct feeding of the distributing pipes in the southern part of the city, thereby increasing the efficiency of the fire hydrants in that district, by giving an increased supply of water to the same.

The extensions of the last three years have been made upon petitions from residents on the several streets, and in order to make these extensions at the least possible expense, the pipes were extended from the nearest terminus of the former pipes, without regard to a proper circulation. At the end of these extended pipes the water becomes in summer time stale, and many complaints about this are being made at this office. A partial remedy was effected by running the fire-plugs occasionally, but a better expedient would be the laying of a few short lines of pipes, thereby effecting a free circulation of the water in the whole system of distributing pipes.

As such, connections are recommended:

1. Euclid street, from Perry street eastward to the present terminus of the pipe west from Hudson street, 900 feet.
2. Lighthouse street, between Water and Spring streets, 500 feet.
3. Perry street, between Cedar and Marion streets, 700 feet.
4. Rockwell street, between Bond and Erie streets, 500 feet.
5. Bond street, from St. Clair street northward, 200 feet.
6. Oak place, from Euclid street southward, 225 feet.
7. West street, from Merwin street eastward, 325 feet.
8. Seneca street, between Champlain and Michigan streets, 250 feet.

The extension of distributing pipes during the year amounts to 4,460 feet, or 0.845 miles.

Appendix A exhibits this extension more specified, and also a statement of all the pipes laid.

Appendix B gives the number of stop-valves set during the year, and a table showing the whole number, and the different sizes of all the stop-valves in use.

With the extension of pipe last year the facilities for extinguishing fires were proportionately increased by the setting of four new fire hydrants, and the connection of two street reservoirs, making the total number of the former 142, and the number of connected reservoirs 27 out of 49, the whole number in the city.

The location of these fire hydrants and street reservoirs is given in Appendix C.

Appendix D shows the number of gallons of water distributed from the works in each month of the past year, the average daily consumption, and the average daily distribution to each inhabitant of the city and to each consumer.

It exhibits, furthermore, a table showing the steady increase of the consumption of water from the works from the year 1857 to 1861, inclusive.

This shows that the increase in the consumption of water from the Water Works has been in the following ratio, to wit.:

In 1858 over 1857, 11 3-4 per cent.
In 1859 over 1858, 30 per cent.
In 1860 over 1859, 31 1-4 per cent.
In 1861 over 1860, 23 3-4 per cent.

The appended table shows also a very large allowance for each consumer; half that quantity would indicate a liberal consumption of water.

Undoubtedly there is every year an equal quantity of water wasted, as is used for all needful purposes. This waste arises partly from leakage under ground by worn out hydrants, which cannot very easily be detected in our sandy soil, and partly from hydrants wantonly left open and the water permitted to run.

The employes of the works are particularly charged to be watchful about such waste, but having only two men who have other duties to perform besides, they cannot detect all the violations of the rules and regulations for the protection of the works. It is earnestly recommended to all water takers to use freely all the water they require, but to allow no waste, as every gallon of water is elevated to the reservoir at the expense of the works, and the water needlessly wasted is a direct loss to the works and the citizens in general.

The number of new connections made with the distributing pipes during the year is as follows:

1 inch connections ....
¾ inch connections ....
⅝ inch connections ....

Total ....

Making the whole number of connections on the last day of December, 1861, 1,083, which are classified as follows:

4 inch connections	2
3 inch connections	1
2 inch connections	18
1½ inch connections	6
1 inch connections	39
¾ inch connections	113
⅝ inch connections	904
Making as above	1,083

VI. GENERAL REMARKS.

It is apparent that a revised tariff ought to be established in connection with a re-assessment of all premises where water from the works is used. Since the issue of the tariff in 1857 some additional rules have been made, together with several important changes in the tariff, which have not or could not be applied to former water takers. The premises of many of our customers have undergone alterations, which fact, in connection with the irregular assessments made at the beginning by the plumbers, makes a re-assessment very desirable.

In conjunction with the introduction of a revised tariff is suggested the propriety of making the water rents come due at stated periods, say 1st of June and 1st of December, instead of falling due every day. By such an arrangement the payment of the water rents would undoubtedly be more regular and punctual, and the time of the employes in the other months of the year could be occupied to better advantage for the protection of the works.

The expenditures during the year have been, according to the certified vouchers, as follows:

I. RUNNING EXPENSES.

Pay rolls for 12 months	$ 6,036 26
Coal	1,176 17
Oil, Mutton Tallow and Soft Soap	178 60
Hardware, Tinsmithing and Plumbing	77 24
Safe	111 50
Advertising and Stationery	67 79
Rent of Storeroom	50 00
Brasswork	39 05
Drills, and other tools for street men	14 60
Ice	5 00
Sundries: Paints, Emery Cloth, etc	21 95
Total	$ 7,778 36
Received for sundry repairs	11 75
Net running expenses	$ 7,766 61

II. REPAIRS.

Pay rolls for 12 months	$ 576 74
Repairs of Machinery, Valves, etc.	465 48
Lumber	153 27
Hardware	37 52

Fire-clay	15 25
Waterlime and Salt	8 06
Water Pails	94
Carpenter Work	19 46
Cartage	3 25
Paving	8 94
Painting	38 75
Drain Pipes for Reservoir	2 50
Brasswork	30 27
Stove Repairing	5 65
White Lime	1 25
Repairing Window Shades	3 01
Stone Steps for Reservoir	12 90
Total	$ 1,383 24
Received for old iron, old brass and lowering fireplugs	32 40
Net expenditures for repairs	$ 1,350 84

III. CONSTRUCTION FUND.

Pay Rolls	$ 81 40
Seeds	2 00
Lifting Screw, etc.	67 32
Earth to Joseph Perkins' Estate	153 59
Total	$ 304 31
Received for old rope	8 16
Net expenditures	$ 296 15

IV. PIPE EXTENSION.

Pay Rolls	$ 246 78
Cast Iron Pipes	932 62
Iron and Cement Pipes	1,987 00
Valves	320 41
Lead	117 93
Valve Boxes	22 62
Packing Yarn	16 61
Coal	4 88
Cement	6 75
Wooden Plugs	5 45
Lumber	13 80
Paving	5 94
Brass Work	12 50
Pounders	5 30
Total	$ 3,698 59
Paid for lowering water pipes, etc.	266 87
Net expenditures	$ 3,431 72

The following estimate of expenses in the ensuing year is herewith submitted:

1.	Running expenses and ordinary repairs	$ [illegible]
2.	Gate house and machinery at lake end of aqueduct, including shore protection	1,000 00
3.	Surface drainage over aqueduct	150 00
4.	New floors in boiler rooms, 2nd flight of spiral stairs in engine house, steps to boiler rooms, flooring of garret, eight sky-lights for same, and filling of archways in foundation	150 00

5. Pavement of inside slope of reservoir with flagging, and repair of three bridges	1.300 00
6. 16-inch main, including valves, etc.	27.000 00
7. Recommended Pipe Extension	3.100 00
Total	$42.500 00

The purchase of a few meters is again solicited, chiefly for the purpose of ascertaining the quantity of water consumed in large establishments, where the water at present is used most lavishly.

The propositions of last year, for a change in the mode of assessing, submitted to the Council, have not met with the approval of that body, and it must be left to some future time to develop a way by which the revenue of the works may be brought to a standard, comparing favorably with the financial conditions of similar works in other cities.

In my opinion, it would be but an act of justice to our customers to have those whose premises are on the lines of water pipes, and who do not take the water, make use of the water and pay for same, like their neighbors.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer.

APPENDIX A.

I. Showing the Extension of Water Pipes in the Year 1861.

Diam. of Pipes in Inch.	In What Street.	Between What Streets.	Feet Laid.	Total Feet.	Remarks.
6	Water	Lake and Lighthouse	180		Cast iron.
		Total 6-inch pipe		180	
4	Brownell	Lake and Willson	297		Iron & cement.
4	Willson	Brownell and Marshall	51		Iron & cement.
4	Lighthouse	Water and Spring	45		Cast iron
4	Kinsman	Jackson and Longworth	1,600		Iron & cement.
4	Johnson	Water and Bank	52		Cast iron
4	Johnson	Water and Bank	480		Iron & cement.
4	Carroll	Pearl and York	46		Cast iron
4	Carroll	Pearl and York	529		Iron & cement.
4	Muirson	Hamilton and St. Clair	33		Iron & cement.
4	Pearl	Chatham and Monroe	60		Cast iron
4	Pearl	Chatham and Monroe	528		Iron & cement.
4	Seneca	Superior and Champlain	582		Iron & cement.
4	Champlain	Seneca and Ontario	61		Iron & cement.
		Total 4-inch pipe		4,164	
3	Water	Fire hydrant conn. opp. Lighthouse.	25		Cast iron .
3	Kinsman	Fire hydrant conn. on Laurel	36		Iron & cement.
3	Kinsman	Fire hydrant conn. near Mayflower.	22		Iron & cement.
3	Muirson	Cistern conn. corner of Hamilton..	105		Iron & cement.
3	Pearl	Cistern conn. corner of Willey	35		Iron & cement.
3	Seneca	Fire hydrant conn. on Champlain..	19		Iron & cement.
		Total 3-inch pipe		116	
		Total of extension in 1861		4,460	

II. Table exhibiting All Pipes Laid to December 31st, 1861.

Diameter of pipes in inches.	24	20	16	10	8	6	4	3	2
Pipes laid previous to 1861..	2,668	10,678	2,608	5,205	11,163	20,009	66,610	4,535	794
Pipes laid in 1861	......	......	......	......	......	180	4,164	116	......
Total	2,668	10,678	2,608	5,205	11,163	20,189	70,780	4,651	794

15,954 ft. 112,782 ft.

15,954 feet, or 3.021 miles of main pipes.
112,782 feet, or 21.360 miles of distributing pipes

128,736 feet, or 24.381 miles in total.

APPENDIX B.

I. Showing the Number and Location of Stop-Valves set in the year 1861.

No.	Waterway in inches.	LOCATION.	
		Street.	Side of street.
1	4	Willson	East line of Brownell.
1	4	Kinsman	East line of Greenwood.
1	4	Kinsman	East line of Mayflower.
1	4	Johnson	East line of Water.
1	4	Johnson	West line of Bank.
1	4	Carroll	West line of Pearl.
1	4	Carroll	East line of York.
1	4	Pearl	South line of Chatham.
1	4	Seneca	North line of Champlain.
9	4	inch Valves in total.	

II. Table Showing All the Stop-Valves in Use Dec. 31st, 1861.

Waterway in inches	24	20	16	10	8	6	4	3 Res. stops	2	Total
In former years	3	14	4	6	18	34	168	25	3	275
In 1861	......	1	......	......	......	......	9	2	......	10
Total	3	13	4	6	18	34	177	27	3	285

APPENDIX C.

Giving Number and Location of Fire-Hydrants and Street Reservoir Connections Added in 1861.

No.	STREET.	LOCATION.	SIDE OF ST
1	Water	Opposite Lighthouse street	East side.
1	Kinsman	Corner of Laurel street	North side.
1	Kinsman	Between Mayflower and Longworth streets.	South side.
1	Seneca	Corner of Champlain street	East side.
4	Fire hydrants	in total.	

Street Reservoir No. 21 at intersection of Muirson and Hamilton streets, and street Reservoir No. 8, in Pearl street, opposite Willey street, were also connected, making the number of reservoirs supplied from the Water Works, 27, out of 49—the whole number in use.

APPENDIX D.

I. Showing the Distribution of Water in the Year 1861.

Month.	Gallons Distributed.		To each inhabitant per day.		To each consumer per day.	
	Per month.	Av. per day.	Gal.	Dec.	Gal.	Dec.
January	20,359,314	656,752	12	.16	85	.29
February	19.108,938	682,462	12	.64	88	.63
March	20,638,518	665,758	12	.32	86	.46
April	22,640,010	754,667	14	.00	98	.09
May	24,844,704	801,442	14	.84	104	.08
June	31,247,316	1,041,577	19	.28	135	.27
July	38,027,076	1,226,686	22	.71	159	.31
August	35,203,236	1.135,588	21	.02	147	.48
September	29,735,862	991,195	18	.35	128	.72
October	28,553,538	921,682	17	.06	119	.70
November	27,783,660	926.122	17	.15	120	.27
December..	24.632,850	775.253	14	.35	100	.69
Total and average.	322.175.022	881.599	16	.32	114	.50

II. Showing the Distribution of Water in Gallons for the Different years from 1857 to 1861, Inclusive.

Year.	Total consumption per year.	Average cons pt'n per day.	Average per day to each inhabitant.		Average per day to each consumer.	
			Gal.	Dec.	Gal.	Dec.
1857	127.262.265	348.664	7	.75	110	.68
1858	142.155.434	389.467	8	.37	93	.44
1859	198.234,090	513.107	11	.31	91	.27
1860	260,220,354	710.984	14	.11	101	.57
1861	322.175.022	881,599	16	.32	114	.50
Total	1,050.017,165					

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ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1862.

VDLA

REPORT

OF THE

BOARD OF TRUSTEES

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OF THE

CITY OF CLEVELAND

For the Year 1862.

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ASTOR, LENOX AND
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REPORT

OF

Trustees of Water Works.

OFFICE OF WATER WORKS.

Cleveland, O., May 19th, 1863.

To the Honorable Mayor and Council of the City of Cleveland:

The trustees of Water Works herewith submit the Annual Report of the Engineer and Superintendent, which exhibits the condition of the works, and the operations in his department during the past year. Your special attention is called to that part of the report which relates to the laying of a second main.

The abstracts, from the secretary's books, show the receipts and expenditures during the year.

All of which is respectfully submitted.

S. F. LESTER,
PETER THATCHER, JR.,
L. M. HUBBY,
Trustees.

REPORT

OF

Secretary of Water-Works.

To the Trustees of the City Water Works:

Gentlemen:—I herewith submit a statement, showing the receipts and expenditures of money, on account of the Water Works for the year 1862.

STATEMENT OF THE MONTHLY RECEIPTS AS SUBMITTED TO THE COUNCIL.

EXPENDITURES.		RECEIPTS.	
January	$ 525 18	January	$ 1,290 55
February	681 24	February	695 60
March	615 14	March	1,409 83
April	801 37	April	1,936 46
May	1,136 46	May	2,209 63
June	964 65	June	1,722 30
July	723 88	July	1,232 22
August	804 63	August	744 63
September	754 82	September	953 72
October	989 20	October	830 90
November	860 25	November	435 81
December	971 75	December	9,664 23
	$ 9,828 57		$23,125 88

ADDITIONAL RECEIPTS.

Account running expenses	40 87
Account repairs	14 87
	$23,181 62
	9,828 57
Net receipts, 1862	$13.353 05
Net receipts, 1861	7,978 65
Excess, 1862	$ 5,374 40
Running expenses and repairs, 1862	$ 9,377 48
Running expenses and repairs, 1861	9,119 20
Excess, 1862	$ 258 28

CASH ACCOUNT, 1862.

Cash on hand, January 1, 1862, as per Report			$ 8,068 08
Cash received for water		$23,125 88	
Deduct running expenses	$ 8,086 19		
Deduct repairs	1,291 29		
Deduct returned water rent	395 35		
		$ 9,772 83	
			$13,353 05
Cash received from the City to pay interest on bonds due in New York			37,100 00
Cash received for interest on bonds unsold			900 00
Cash received on Construction Fund account			120 65
Cash for Exchange on New York			2 00
Cash on bills receivable			44 00
Cash of the Ocean Bank, New York			842 00
			$60,429 78

Cash paid interest on water bonds	$36,582 50
Cash paid Ocean Bank, New York (unpaid coupons)	517 50
Cash paid for pipe extension	3,792 67
Cash deposited in the Ocean Bank, New York	900 00
Cash paid Joseph Perkins, balance of account	13 34
Cash on hand, January 1, 1863	18,623 77
	$60,429 78

LEDGER BALANCES, JANUARY, 1863.

Cash	$18,623 77	Water rent	$30,394 28
Construction Fund	2,795 50	Coupons	925 90
Pipe extension	43,982 35	Interest and exchange	3,003 61
Ocean Bank	1,177 42	Bonds	35,000 00
Bills receivable	116 00		
Commissions	58 75		
Discount	2,570 00		
	$69,323 79		$69,323 79

ASSETS.

Cash	$18,623 77	
Bonds	15,000 00	
Bills receivable	116 00	
Ocean Bank	659 92	
		$34,399 69

Respectfully submitted,
GEORGE W. GIRTY,
Secretary.

Water Works Office, Cleveland, Jan. 1, 1863.

REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, January 15th, 1863.

To the Board of Trustees of Water Works:

Gentlemen:—In submitting herewith the Seventh Annual Report upon the condition of the City Water Works and their operations, during the year 1862, your Superintendent and Engineer respectfully solicits your earnest attention to the following statements, relating to the several distinct parts of the works:

I. INLET, TOWER AND AQUEDUCT.

These parts of the works are in as good a condition as could be expected.

The stone filling between the concentric rows of spiles which constitute the tower has, by the action of the waves, been solidified, and needs now about 25 perches of stone to raise it again to the surface of the water.

The protection over the inlet at the lake shore requires some repairs and additional timbers to protect the land behind it against washing, when the lake is under the influence of heavy northern winds.

The gate-house, with the necessary machinery for opening and closing the communication between the inlet pipe and the aqueduct, and for emptying the latter, has to be erected during the ensuing year.

The improvement of the land along the line of the aqueduct should no longer be delayed, as serious damages may result from the want of those improvements, which were specified in last year's report.

II. ENGINE HOUSE.

The roofs of the buildings were last year closely examined, repaired and painted, and the exterior of the whole structure is in a very satisfactory condition.

The sheet iron top moulding of the smokestack is rusted out, and gives the chimney a dilapidated appearance. This moulding should be renewed, and the stays of the chimney should be altered and strengthened.

The old temporary blacksmith shop on engine house lot is so decayed that to keep it in proper repair is out of the question. The old shop has been very useful and saved much time and expenditures for small repairs, which the employes of the engine house performed therein.

Should you entertain the proposition to build a new one, it would be well to arrange its position so that buildings required at some future time may be added without inconvenience or a partial tearing down of previous ones.

Plans for this purpose will be submitted to you at an early period.

The painting of the inside woodwork and the engines has not been renewed since the works are in operation; this is now over six years, and it would be a well-invested expenditure to give them an additional coat of paint during the coming season.

The spiral stairs around the stand pipe, from the engine floor to the beam floor, have settled on the outside and are now over half an inch out of level. It will be necessary to raise these stairs again to the proper level, before the painting of the woodwork is commenced.

III. ENGINES AND BOILERS.

The air-pump shop of West engine had to be renewed during the past year; the injection gear of both engines received new pins, the main pumps new air-cocks, and the boilers were supplied with new brace-pins—which constituted all the repairs that were required last year for the engines.

The whole machinery is in the most satisfactory condition, and able to do as much duty as any pumping engines on this continent or in Europe.

The East Engine has run 1,224 hours 15 minutes.
The West Engine has run 1,122 hours 50 minutes.

Total running time, 2,347 hours 5 minutes.

Having worked 309 days during the past year, the average running time per day was 7 hours 35 3-4 minutes. Which is an increase over last year of 49 1-4 minutes per day.

Number of strokes of East Engine....	603,407
Number of strokes of West Engine....	559,087
Total number of strokes	1,162,494

Average height above surface of lake, at which the water was delivered .... 156,357 feet.
Average duty of East Engine............35,102,083
Average duty of West Engine............34,317,546 pounds of water raised 1 foot high, with every 100 pounds of coal consumed.

In the calculation of this duty, the entire quantity of fuel consumed for raising steam and pumping is included.

It is recommended to continue the use of slack coal for generating steam, as the results from its use the past year, have again been favorable, when compared with the performance of the engines when coarse coal was used.

During the past year the engines did not perform as much duty as in the preceding three years.

This shortcoming the undersigned attributes partly to his introduction of measuring the fuel by cubic feet, instead of weighing, whereby a more accurate account of the consumption of fuel has been obtained; as the difference between the quantity received and consumed is nothing, whilst in former years a deficiency of from 80 to 85 tons per annum was the result of weighing the coal in small quantities to the boilers; in other words, the figures for 1862 represent the actual duty performed, while those in former years were based upon the weight of the coal to the boilers, without counting the deficiency.

Other reasons for this low duty are existing, but beyond the control of your Superintendent, except at great risks to the works.

As from present prospects the price of coal will be considerably higher this year, it will be a matter of importance to practice economy in an article that will absorb one-third of the total running expenses.

IV. RESERVOIR.

The valve-bridges have been thoroughly repaired. By providing a circulation of air around and between the ends of the beams, resting in the embankments, the rapid decay of the same is prevented; and it is thought that these structures will now last for a long time.

By your direction the brick pavements of the inside slopes were repaired last spring; but the same operation will be required again during the present year; should you think proper, to delay the substitution of a more durable material to some future time.

V. DISTRIBUTION.

The entire system of water pipes is in good repair and satisfactory condition.

A comparatively small number of leaks in pipe and stop-valve joints had to be repaired, and at no time during the past year was the city deprived of water for a single moment.

There are, however, on the main pipe, that supplies the east side of the city with water, two places from which serious trouble may be apprehended at no distant time. One is in West River street, between Centre street and the old Canal, where the pipe lies 15 feet below the surface. The other in the same street on a point near the river, where the pipe curves from the shore to the street parallel with it.

The first one was mentioned in the reports of 1859 and 1860, and was omitted last year on account of the prospect of commencing the proposed second main immediately. And it was thought best to delay all larger repairs on the old main until the East Side can be supplied through the new one.

The second one is a curve made with short pieces of straight pipe, and in consequence thereof, the lead joints in the sockets are conical. When such a joint has once started it will leak every few weeks, and the lead in the joints will become less every time it is repaired, until it is necessary to cast the joint entirely new.

Should either of these places require a serious repair, it could only be done by shutting the water off from the East Side for at least 24 hours, when not for days, and as the sole safeguard against any such contingency, the laying of another main across the river is again most earnestly recommended.

The observations made during the past year confirmed that the route recommended for this main last year is decidedly the best and most advantageous that can be established; the more so, as it will not only secure an uninterrupted supply to the East Side, but will be a source of revenue also by enabling the works to supply Scranton's and Stone's flats with water, particularly needed there for manufacturing purposes.

For the reasons the laying of at least a part of this second main during the coming season is again suggested.

Part of the distributing pipe—connections proposed last year—were with your consent executed; and it is desirable to make the remainder during the coming season.

The extension of pipe during the past year amounts to 5,963 feet, or 1.13 miles, of which schedule "A" gives a detailed statement.

Schedule "B" exhibits the number and size of stop-valves set during the year, in connection with the pipe extension, and also a table of the whole number and the different sizes of all the stop-valves in use.

Schedule "C" gives the additional fire hydrants and street reservoir connections completed during the year 1862, making the facilities for extinguishing fires at the end of the year: 149 fire hydrants and 28 connected street cisterns.

Schedule "D" exhibits the operations of the works during the year, and the consumption of water during the same period. It gives also a tabular statement of the increase in the consumption of water from the works, from the year 1857 to 1862, inclusive, showing an increase of 1862 over 1861 of 14 1-2 per cent.

New connections with the distributing mains were made during the past year, as follows:

3 inch connections	2
1½ inch connections	1
1 inch connections	3
¾ inch connections	3
⅝ inch connections	100
Total	109

The entire number of connections with the distributing pipes on the last day of December, 1862, was 1,192, which are classified as follows:

4 inch connections	2
3 inch connections	3
2 inch connections	18
1½ inch connections	7
1 inch connections	42
¾ inch connections	116
⅝ inch connections	1,004
Making as above	1,192

VI. GENERAL REMARKS.

The suggestion made in last year's report, about the establishment of a revised tariff of water rates in connection with a re-assessment, was, after due deliberation on the subject, approved by you, and the new arrangement went into operation at the close of the year 1862.

The new assessment of all premises, supplied with water from the works, proved—notwithstanding the rates of the tariff were considerably lowered—beneficial to the works and the water takers in general are satisfied with the more equitable assessment and subsequent charges for the water.

The first payment of the semi-annual water rent, under the new rules and regulations in December last, may be called satisfactory and prompt, upon reflection that this was the first time our customers were not individually notified through the postoffice, as heretofore.

Only 80 of the whole number of water takers had to be turned off on account of non-payment; 26 of them had the water turned on again, and 54 remain shut off at present.

It is confidently expected that on the next term of payment in June, 1863, a still more prompt compliance with the rules will be observed.

The financial statement of your secretary shows that the receipts for water rents from the same number of customers, have been larger in December than ever before, showing that the predictions about an increase of income from a new assessment have been correct.

It will not be out of place to remark here, for the benefit of those who think our Water Works a burden to the city in general, that this financial statement does not include the value of the water supplied for city use, as in conformity with the State laws. The Public Schools, Council Hall, Police Court and other public buildings are supplied without charge; and that the water used by the Fire Department is also furnished free. These items would give a large amount of money. The City of Buffalo pays $20,000 per annum for the use of the water for these purposes to their Water Works. The benefits derived from our works by the city at large, through the speedy extinguishment of fire, and the marked improvement in the general health and cleanliness of the city since the introduction of the water, should be estimated as being of more value than the entire cost of the Water Works.

The expenditures during the past year have been according to the certified vouchers:

I. RUNNING EXPENSES.

Pay rolls for 12 months	$ 6,107 51
Coal	1,304 51
Oil, Mutton Tallow and Soft Soap	83 86
Cotton waste and hemp packing	159 84
Hardware, Tinsmithing and Plumbing	30 58
Small stores	16 75
Brasswork	45 72
Tools for street men	13 12
*Advertising, printing and stationery	260 17
Rent of Storeroom	50 00
Livery	4 00
Ice	5 00
Lawyer's fees	46 00
Total	$ 8,127 06
Received for sundries	33 87
Net running expenses	$ 8,093 19

II. REPAIRS.

Pay rolls for 12 months	$ 666 80
Repairs of Machinery	166 63
Lumber	6 48
Hardware	74 22
Carpenter Work	164 22
Paving	1 88
Painting	70 39
Brasswork	35 00
Firebricks and clay	11 33
Bricks for reservoir	52 00
Water lime	9 65
Repairing tools	17 74
Repairing clocks	7 00
Repairing scales	9 00
Repairing roofs of engine house	8 17
Repairing gas fixtures	1 75
Manure for reservoir	3 90
Total	$1,306 16
Received for sundry repairs	14 87
Net expenditure for repairs	$ 1,291 29

III. CONSTRUCTION FUND.

Carpenterwork	$ 57 80
Painting	11 40
Coal Tar	1 75
Valve braces	40 44
Trees	26 50
Total	$ 137 89
Received for one Worthington steam pump, and a short piece of stand-pipe	258 54
Net receipts construction fund	$ 120 65

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*This amount includes the printing of the new rules and regulations, by-laws and tariff, and also an entire new set of books, required through the new assessment.

IV. PIPE EXTENSION.

Pay rolls	$ 247 44
Cast iron pipe	755 28
Iron and cement pipes	2,321 94
Stop valves	173 50
Valve boxes	14 50
Lead	27 50
Coal	4 00
Sandstone	1 50
Wooden plugs	3 76
Pipe layers' clay	7 01
Brasswork	24 50
Tools	7 98
Patterns	13 60
Flush hydrants, for street sprinkling	17 80
Meters	466 00
Total	$ 4,086 31
Received for sundries	318 64
Net expenditures pipe extension	$ 3,767 67

The following estimate of expenses for the ensuing year is herewith submitted:

1. Running expenses and ordinary repairs	$10,500 00
2. Gatehouse and repair on inlet tower	1,500 00
3. Drainage over aqueduct	150 00
4. Repairs at engine house	850 00
5. Pavement of inside slopes of reservoir	1,500 00
6. New sixteen-inch main	30,000 00
7. Pipe extension	3,000 00
Total	$47,500 00

Some of the meters purchased last December are now in active use. They were set at the request of parties, who thought the new assessment too high, and agreed to pay by meter measurement, but the period of their use being too short yet, no result from the application can be reported.

The mention of an object not strictly appertaining to the Water Works, may find a place here, as your attention to it may have the gratifying effect of procuring some action of our Honorable Council.

The Water Works Engine House, with its imposing machinery, has long ago become a place of attraction for our citizens, as well as for all strangers sojourning in our city.

The sole avenue to it is through Kentucky street, which is, from Detroit street to the Engine House, in such a wretched, deplorable condition, that it is impossible to drive down or up the hill, and many strangers, hiring a carriage for the express purpose of visiting the Water Works, are compelled, either to alight on the top of the hill near Detroit street, and walk down to the Engine House, or to return, disappointed, without having accomplished their object.

In consideration of the facts it is respectfully suggested, that you may recommend to the City Council, such steps as will insure the grading and improving of that part of Kentucky street, lying between Detroit and Division streets, which is, or rather would be as much frequented as any street in the city, were it in a less perilous condition.

In conclusion you will please to permit a few remarks upon an assertion, heard so often repeated by water takers and others, to-wit: "The lake water is of very little use in our city, as we have splendid wells on our premises, furnishing all the water for kitchen and table use."

This is chiefly claimed under the impression that the clearness of the well water is an evidence of its purity; but it is well known in chemistry that this idea is by no means correct.

The soil, upon which our city is built, is mostly composed of sand and gravel, thus forming a natural filter for the water passing through it, which fact accounts for the clearness of most of our well water. But whilst the water is thus freed from the impurities, held in suspension, the dissolved organic matter, with which the water is impregnated, still remains, and, although aiding in the sparkling appearance of the water, conceals beneath it, not only a picture repulsive to contemplate, but dangers of a serious character.

The analysis of the well water of Cleveland, made by Prof. Mather, of Columbus, demonstrates clearly that all are more or less contaminated with the impurities from drains, sinks, cesspools, etc., that percolate with the water into the wells, making their water unpalatable and unhealthy; whilst he says of the water of Lake Erie: "It is usually clear, always cool and pleasant to the taste, and as good, wholesome and pure water as can be obtained and as any city need desire."

All of which is respectfully submitted,

JOSEPH SINGER,
Superintendent and Engineer.

SCHEDULE A.

I.—Showing the Extension of Water Pipe in the Year 1862.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
6	Detroit	Intersection of Pearl	38	....	Cast iron.
6	Euclid	From Perry, eastward	22.5	....	Cast iron.
6	Prospect	From Hudson, eastward	17.5	....	Cast iron.
6	Prospect	From Hudson, eastward.............	72		Iron & cement
		Total 6-inch pipe	....	150	
4	Seneca	Champlain and Michigan	52	....	Cast iron.
4	Seneca	Champlain and Michigan	225	....	Iron & cement
4	Champlain ...	Champlain and Michigan	225	....	Cast iron.
4	Champlain ...	Ontario and Seneca	515	....	Iron & cemen
4	Detroit	Pearl and Wall	250	....	Iron & cemen
4	Howe	Ontario and Seneca	40	....	Cast iron.
4	Howe	Ontario and Seneca	400	....	Iron & cemen
4	Perry	Cedar and Marion	703	....	Iron & cemen
4	Euclid	Perry and Hudson	975	....	Iron & cemen
4	Euclid	Perry and Hudson	5.5	....	Cast iron.
4	Merwin	British and Columbus	441	....	Cast iron.
4	West	Merwin and Vineyard	106	....	Cast iron.
4	West	Merwin and Vineyard	36.5	....	Iron & cemen
4	Spring	Lighthouse and Front	413	....	Cast iron.
4	Miami	From Ohio, northwards	51.5	....	Cast iron.
4	Miami	From Ohio, northwards	72	....	Iron & cemen
4	Pittsburgh ..	From former pipe to s. of Liberty...	1,270	....	Iron & cemer
4	James	Intersection of Merwin	30		Cast iron.
		Total 4-inch pipe	....	5,597	
3	Rockwell	Fire hydrant conn. opp. schoolh'se	23	....	Cast iron.
3	Merwin	Fire hydrants conn. opp. R.R. Depot	28	....	Cast iron.
3	Howe	Fire hydrants conn. at end of pipe..	6	....	Cast iron.
3	Spring	Fire hydrants conn. corner of Front	19	....	Cast iron.
3	Perry	Fire hydrants conn. cor. of Garden	24	....	Iron & cemen
3	Euclid	Fire hydrants conn. East of Perry.	38	....	Iron & cemen
3	Pittsburgh ...	Fire hydrants conn. corner of Perry	28	....	Iron & cemen
3	Pittsburgh ...	Cistern conn. corner of Liberty......	50		Iron & cemen
		Total 3-inch pipe	....	216	
		Total of extension in 1862........	....	5,963	Or 1.13 miles.

II. Table, Exhibiting all the Pipes Laid to December 31, 1862.

Diameter of pipes in inches.	24	20	16	10	8	6	4	3	2
Pipes laid previous to 1862..	2,668	10,678	2,608	5,205	11,163	20,189	70,780	4,651	794
Pipes laid in 1862	......	......	......	......	......	150	5,597	216	......
Total	2,668	10,678	2,608	5,205	11,163	20,339	76,377	4,867	794
	15,954 feet.			118,745 feet.					

15,954 feet, 3.021 miles of main pipes.
118,745 feet, or 22.490 miles of distributing pipes.

134,699 feet, or 25.511 miles in total.

SCHEDULE B.

I.—Showing the Number, Size and Location of Stop-Valves Set in 1862.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	6	Detroit	West line of Pearl.
1	6	Prospect	East line of Hudson.
2	6	inch Valves.	
1	4	Seneca	North line of Michigan.
1	4	Seneca	South line of Champlain.
1	4	Champlain	West line of Ontario.
1	4	Champlain	West line of Seneca.
1	4	Howe	West line of Ontario.
1	4	Perry	South line of Garden.
1	4	West	East line of Merwin.
1	4	Pittsburgh	West line of Perry.
1	4	Pittsburgh	West line of Liberty.
1	4	Spring	South line of Front.
1	4	Miami	North line of Ohio.
11	4	inch Valves.	

2 6-inch valves.
11 4-inch valves.
—
13 valves in all.

II.—Table Showing the Number and Size of all the Stop-Valves in Use December 31, 1862.

Waterways in inches.	24	20	16	10	8	6	4	3	2	Total.
In former years	3	13	4	6	18	34	177	27	3	285
In 1862	......	......	......	......	......	2	11	1	......	14
Total	3	13	4	6	18	36	188	28	3	299

SCHEDULE C.

Giving Number and Location of Fire Hydrants and Cistern Connections Added in 1862.

No.	STREET.	LOCATION.	SIDE OF ST.
1	Rockwell	Between Wood and Bond	South side.
1	Merwin	Between British and Columbus.....	East side.
1	Howe	At end of pipe	Centre of St.
1	Spring	Corner of Front	West side.
1	Perry	Corner of Garden	West side.
1	Euclid	Between Perry and Hudson	South side.
1	Pittsburgh ...	Corner of Perry	East side.
7			

Street Reservoir No. 25, in Liberty street, near its intersection with Pittsburgh street, was also connected, making the number of reservoirs supplied from the Water Works, 28 out of 49, the whole number in use.

SCHEDULE D.

I.—Showing the Distribution of Water in 1862.

Month.	Gallons Distributed.		Distributed for each Inhabitant Per Day.		Distributed for each Consumer Per Day.	
	Per Month.	Per Day.	Gall.	Dec.	Gall.	Dec.
January	25,627,620	826.697	15	89	98	41
February	23,337,702	833,489	16	02	99	22
March	25.748,460	830,595	15	97	98	87
April	25,303.260	843,442	16	22	100	40
May	31.776.150	1,025,037	19	52	122	07
June	33,552,498	1,118,416	21	50	133	18
July	36,999,618	1,193,539	22	95	142	08
August	39,443,448	1,272,369	24	46	151	35
September	35,809,026	1.193.634	22	95	142	08
October	32,696,760	1,054,734	20	28	125	56
November	29,003,190	966.773	18	59	115	09
December	30,375,360	979,850	18	84	116	64
Total	369,673,092	1,012,794	19	47	120	57

II.—Showing the Distribution of Water in Gallons for the Different Years from 1857 to 1862, Inclusive.

Year.	Total Consum'n in Gallons Per Year.	Average Consumption Per Day.	Average per Day for Each Inhabitant.	Average per Day for Each Consumer.
1857	127.262,265	348,664	7.75	110.68
1858	142,155,434	389,467	8.37	93.44
1859	198,234.090	513.107	11.31	91.27
1860	260,220,354	710,984	14.11	101.57
1861	322.175,022	881,599	16.32	114.50
1862	369,673,092	1,012,794	19.47	120.57

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ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1863.

8

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REPORT

OF THE

BOARD OF TRUSTEES

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OF THE

CITY OF CLEVELAND

For the Year 1863.

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REPORT

OF

Trustees of Water Works.

To the Hon. Mayor and Common Council of Cleveland:

Gentlemen:—The Trustees of the Water Works herewith submit the Annual Report of the Superintendent and Engineer, which exhibits the condition of the works, and the operations in his department during the year.

The report of the Secretary shows the receipts and expenditures during the year.

We have examined the reports and find them full and explicit, and anything we may say in addition seems uncalled for; we therefore respectfully submit the reports.

S. F. LESTER,
PETER THATCHER,
L. M. HUBBY,
Trustees.

Office of the Water Works, Cleveland, April 2nd, 1864.

REPORT OF SECRETARY OF WATER WORKS.

To the Trustees of Water Works:

Gentlemen:—I herewith submit a statement, showing the receipts and expenditures of money, on account of the Water Works for the year 1863.

RECEIPTS.

Cash on hand January 1, 1863			$18,623 77
Cash received for water		$23,679 30	
Deduct running expenses	$10,011 96		
Deduct repairs	835 54		
Deduct returned water rent	258 00		
		$11,105 50	
			$12,573 80
Cash received from the city to pay interest on bonds			$37,100 00
Cash received from the city for interest on bonds unsold			900 00
Cash received on bills receivable			10 00
			$69,207 57

DISBURSEMENTS.

Cash paid interest on water bonds	$36,970 00	
Coupons not presented	130 00	
		$37,100 00
Cash deposited in the Ocean Bank, N. Y.		900 00
Cash paid for pipe extension		7,946 95
Cash paid account construction fund		17 39
Cash on hand January 1, 1864		23,243 23
		$69,207 57

LEDGER BALANCES, JANUARY 1, 1864.

Cash	$23,243 23	Water rent	$42,968 08
Construction Fund	812 00	Coupons	1,055 90
Ocean Bank	2,207 42	Interest and exchange	3,903 61
Bills receivable	106 00	Bonds	35,000 00
Commissions	58 75		
Discount	2,570 00		
Pipe extension	51,929 30		
	$82,927 59		$82,927 59

ASSETS.

Cash on hand	$23,243 89
Ocean Bank, deposit	1,429 92
Bills receivable	106 00
Bonds, unsold	15,000 00
	$39,779 81

The receipts for water is in excess of 1862, $553.42. The disbursements for running expenses, repairs and returned water rents is in excess of 1852, $1,332.67.

The non-renewals of water takers, in December, together with a claim for water, in process of collection, which, if they had been realized in December, would have increased the receipts for water about $2,500.

Respectfully submitted,

GEO. W. GIRTY,

Secretary.

Water Works Office, Cleveland, Jan. 1, 1864.

REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, Jan. 1st, 1864.

To the Board of Trustees of Water Works:

Gentlemen:—In conformity with the law, the Eighth Annual Report upon the conditions of the City Water Works and their operations during the past year is herewith respectfully submitted.

In soliciting your kind attention to the following statement, your Superintendent and Engineer will relate the present state of the several distinct parts of the works, as follows:

I. INLET TOWER AND AQUEDUCT

are in satisfactory condition, with the exception of a few repairs, mentioned already in last year's report, and the building of the gate house on the lake shore.

During last month the bracing timbers of the cut through the Junction Railroad were all stolen, and in consequence the perpendicular sides of the cut will fall in as soon as the frost leaves the ground, assuming a natural slope. The falling earth may have a serious effect upon the wooden centers, which protect the brick aqueduct against the undue pressure of the railroad embankment. This subject has been treated already several times in former reports, and is earnestly recommended to your special attention.

The draining of Old River street, in which the Aqueduct is located, is again commended to your early action, and the filling of about two feet over the whole line of aqueduct, as the best remedy for the existing evil, proposed.

II. ENGINE HOUSE.

The whole structure is in a good state of preservation.

The following repairs are recommended:

1. Renewing the sheet iron top moulding of the iron chimney, or the entire removal of the remaining parts of the old moulding.
2. Repainting of the main entrance doors.
3. Repairing of ceiling on third floor.

4. Repainting inside of engine house.
5. Finishing of spiral iron stairs, at the north end of engine house.
6. Examination and, if found necessary, repainting of roofs.

The temporary coal bins, built in 1857, are decayed, and should be renewed by more substantial ones, and covered. But it is thought advisable to do this in connection with an extension of the A. & G. W. R. W. track, which will terminate at the easterly line of engine house lot. Continuing this track in our lot will enable us to receive coal directly to the bins without cartage.

Sad havoc has been made, by mischievous boys, on the willow hedges, during the time the Old River Bed was frozen, by tearing off the willows and thereby ruining almost a whole year's growth of the hedges. Should you devise some means by which this constant destruction of the Water Works property could be stopped, it would be no small remuneration for the care taken to establish and preserve a natural fence around the premises, which will not only effectually enclose the lot, but will contribute to its better appearance.

III. ENGINES AND BOILERS.

According to the report of the engine man, in charge of the engines, they are in excellent condition, including pumps and boilers. He recommends the re-clothing of some steam pipes, additional braces to the large flat sides of the lower valve chambers, and steam gauges for the boiler rooms.

I concur in his recommendations, and think that the steam gauges will add to the more regular working of the engines, as the firemen have not that leisure time now, which they had formerly, to go to the engine room to observe the gauges there.

The required repairs on the engines consisted, last year, in a new shaft for air pump connection of East engine and refitting of piston of West engine, including a new set of washers.

The East Engine has run last year....	1,187 hours	35 min.
The West Engine has run last year....	1,402 hours	55 min.
Total running time	2,290 hours	30 min.

Having worked 309 days during the past year, the average running time per day was 8 hours 23 minutes, which is an increase over the previous year of 47 1-4 minutes per day.

Number of strokes of East Engine..............	605,475
Number of strokes of West Engine..............	705,400
Total number of strokes	1,310,875
Average height above surface of Lake Erie to which the water was raised	156,935 feet
Average duty of East Engine	36,788,845 lbs.
Average duty of West Engine	34,541,163 lbs.

of water raised one foot high with every 100 lbs. of coal consumed for raising steam and pumping.

The engines have performed a little better than the year previous, but still the duty is low in comparison with other similar engines, and economy in fuel ought to be one of the chief aims of their manager.

IV. RESERVOIR.

This part of the works is in as good a condition as may be expected; there are no particular repairs required, and the changing of the inside brick lining above the water line may be deferred until another season, at which time a plan for avoiding the constant repairs of these brick-lined slopes, different from those formerly recommended, will be submitted to you.

V. DISTRIBUTION.

The entire system of water pipes is in a satisfactory state of preservation. No serious leak or break has occurred during last year, and the constant copious supply of water to the city was not interrupted at any time.

Your decision to commence the formerly recommended second main this year, shows that you have the welfare of the city at heart, and by securing thus an uninterrupted and equal supply of water to all parts of the city, cannot fail to earn the acknowledgment of all citizens and their commendation upon your forethought and wisdom.

It is thought advisable to call your attention to the fact that the City Council intends to grade and pave Prospect street, from Ontario to Hudson street, and that any alteration on the water pipes in that street should be executed before this important improvement is made.

The distributing main in Prospect street is of 10 inches diameter from Ontario street to about 300 feet east of Perry street, where it is reduced to a 6-inch pipe, extending to Hudson street 1,700 feet.

This 6-inch pipe should be taken up and the 10-inch line continued through the entire length of Prospect street, to connect at Willson avenue with Euclid street 4-inch line, thus giving an additional supply to Euclid street, without the necessity of laying another main in the easterly part of the city.

Distributing pipes should also be laid in all streets which the City Council intends to improve permanently, previous to such improvement, to avoid the necessity of tearing up pavements.

The extension of distributing pipes during the past year was 9,564 feet, or 1.811 miles, of which Schedule A gives a detailed statement.

Schedule B exhibits the number and size of the stop-valves set during the year in connection with the pipe extension, and also a table showing the whole number and the different sizes of all the stop-valves in use.

Schedule C gives the additional fire hydrants and street cistern connections completed in 1863, making the facilities for extinguishing fires at the present day, 158 fire hydrants and 29 connected street reservoirs.

Schedule D exhibits the pumping operations of the works during last year, and the consumption of water in the same period. It gives, also, a tabular statement of the increase in the consumption of water from the works for the year 1857 to 1863, inclusive, showing an increase in 1863 over 1862 of 13 3-4 per cent.

New connections with the distributing pipes have been made during the past year, as follows:

4 inch connections	1
2 inch connections	2
1½ inch connections	2
1 inch connections	9
¾ inch connections	3
⅝ inch connections	115
Total	132

The entire number of service pipe connections on the last day of December, 1863, was 1,324, which are classified as follows:

4 inch connections	3
3 inch connections	3
2 inch connections	20
1¾ inch connections	9
1 inch connections	51
¾ inch connections	119
⅝ inch connections	1,119
Making as above	1,324

VI. GENERAL REMARKS.

The expenditures of last year have been, according to the certified vouchers:

I. RUNNING EXPENSES.

Pay rolls for 12 months	$ 6,778 47
Coal	2,526 98
Oil, tallow and soft soap	193 13
Cotton waste and packing	82 60
Hardware and plumbing	106 81
Small stores	29 64
Brasswork	149 21
Ironwork	9 33
Advertising, printing and stationery	118 55
Rent of store rooms	50 00
Livery	4 50
Ice	13 50
Tinware	2 35
	$10,065 07
Received for sundries	77 16
Net expenditure running expenditures	$ 9,987 91

II. REPAIRS.

Pay rolls for 12 months	$ 564 54
Repairs of machinery and tools	68 16
Lumber	67 57
Hardware	44 53
Carpenter work	31 74
Paving	2 62
Painting and glazing	6 00
Brasswork	20 50
Fire bricks and clay	12 00
Valves	24 00
Small stores	40 50
	$ 882 16
Received for sundries	22 62
Net expenditures, repairs	$ 859 54

III. CONSTRUCTION FUND.

Chandeliers for engine house	$ 68 41
Received for sundries	51 02
Net expenditure, construction fund	$ 17 39

IV. PIPE EXTENSION.

Pay rolls for 12 months	$ 315 31
Cast iron pipes and valve boxes	2,389 53
Iron and cement pipes	5,313 06
Valves	602 02
Valve boxes	10 88
Lead	319 68
Plumbing	12 42
Coal	5 71
Wood plugs	10 48
Ironwork	71 19
Hardware	5 21
Patterns	62 45
Carpenterwork	11 02
Meters	118 44
	$ 9,247 40
Received for sundries	1,300 45
Net expenditure for pipe extension	$ 7,946 95

The following estimate of expenditure for the ensuing year is herewith submitted:

1.	Running expenses and ordinary repairs	$12,000 00
2.	Gate house, etc., at lake	2,000 00
3.	On aqueduct	300 00
4.	On engine house	500 00
5.	On second main pipe	25,000 00
6.	On pipe extension	5,200 00
	Total	$45,000 00

The meters have proved, in most instances, that the former assessments were below the actual quantity of water consumed, whilst in others, where the consumption could be estimated upon known facts, they showed the correctness of the assessments so made, and it is recommended that the meters, already on hand, are kept for making further experiments.

In regard to a more general introduction of meters for large consumers, it is recommended, that whoever is not satisfied with the assessments, may buy a meter of an approved pattern and have it set at his own expense, in which case the Water Works will furnish the water to such customers at a given price per cubic foot or per barrel, without incurring any expenses for the meter.

The chief avenue to the engine house is still in a very unsettled and unsatisfactory state. The main portion of Kentucky street, between Detroit and Division streets, does not belong to the city at all. Our pumping main runs through private property, which is also used for a roadway. In last year's report this matter was brought before the City Council, but as yet no action has been taken, wherefore it is again earnestly solicited to ask the City Council to take some steps in the matter.

In many cities supplied with water from Water Works, the tariff of rates was raised during the past year on account of the rise in fuel and wages. It is, however, considered a wise conclusion that you retain the prices fixed by the tariff of 1861, notwithstanding the prices were increased in the same ratio as in other places, and it is recommended to pursue the same course so long as the expenses for pumping the water will permit.

The old map of the city, upon which our pipes, valves, fire hydrants, service pipes, etc., are laid down, was made on too small a scale and on a single sheet of paper mounted and hanging on the office wall, exposed to rapid destruction. The making of an entire new map on a larger scale and in sheet on vellum, so that the whole can be bound in book form is a desideratum that has become a necessity now, and will prove a very valuable acquisition for the Water Works when completed; and it is earnestly recommended that you may order its commencement without delay.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer.

SCHEDULE A.

I. Showing the Extension of Water Pipes in the Year 1863.

Diam. of Pipes in Inch.	In What Street.	Between What Streets.	Feet Laid.	Total Feet.	Remarks.
8	Centre	Second and Cedar	610	....	Iron & cement
		Total of 8-inch pipe		610	
6	Franklin	Duane and Harbor	785	....	Iron & cement.
6	Detroit	Pearl and Terrace	218	....	Iron & cement.
6	Detroit	From Pearl eastward	41	....	Cast iron.
		Total 6-inch pipe		1,044	
4	Frankfort ...	Intersection of Bank	29	....	Cast iron.
4	Merwin	British and Columbus	565	....	Cast iron.
4	German	Merwin and Summer	260	....	Cast iron.
4	Summer . . .	German and Leonard	98	....	Cast iron.
4	Huron	Erie and Brownell	84	....	Iron & cement.
4	Clinton	State and Kentucky	1,200	....	Iron & cement.
4	Kentucky . .	Intersection of Franklin	4	....	Iron & cement.
4	Duane	Franklin and Clinton	409	....	Iron & cement.
4	Duane	Intersection of Franklin	305	....	Cast iron.
4	Willey	Pearl and Columbus	289	....	Iron & cement.
4	Wood	St. Clair and Rockwell	258	....	Iron & cement.
4	Wood	Intersection of St. Clair	40	....	Cast iron.
4	Miami	Ohio and Eagle	1,265	....	Iron & cement.
4	Wallworth . .	From Miami eastward	132	....	Iron & cement.
4	Detroit . . .	Wall and Hanover	297	....	Iron & cement.
4	Wall	Branch from Detroit	2	....	Iron & cement.
4	Champlain . .	Seneca and Canal	337	....	Iron & cement.
4	Marshall . .	St. Clair and Lake	593	....	Iron & cement.
4	Hamilton . .	Branches from Marshal	4	....	Iron & cement.
4	Lake.	Branches from Marshal	4	....	Iron & cement.
4	Pearl	Detroit and Spruce	985	....	Iron & cement.
4	Pearl	Intersection of Detroit	39	....	Cast iron.
4	Vermont . .	Branches from Pearl	4	....	Iron & cement.
4	Washington	Branches from Pearl	4	....	Iron & cement.
4	Spruce	Pearl and Elm	916	....	Iron & cement.
4	Mulberry . .	Branches from Spruce	4	....	Iron & cement.
4	Main	Centre and Elm	332	....	Iron & cement.
4	Elm	Main and Second	316	....	Iron & cement.
4	Second . . .	Branches from Elm	4	....	Iron & cement.
4	Seneca	Michigan and Canal	256	....	Iron & cement.
4	Seneca	Intersection of Michigan	40	....	Cast iron.
4	High	Intersection of Ontario	58	....	Cast iron.
		Total 4-inch pipe		7,720	
3	Frankfort . .	Fire hydrant corner Bank...........	7	....	Cast iron.
3	Merwin . . .	Fire hydrant front Nat. Mill	16	....	Cast iron.
3	Franklin . . .	Fire hydrant west Kentucky.........	18	....	Iron & cement.
3	Duane. . . .	Cistern connection at Clinton	6	....	Iron & cement.
3	Detroit. . . .	Fire hydrant corner Hanover	27	....	Iron & cement.
3	Lake	Fire hydrant opposite Marshall	26	....	Iron & cement.
3	Pearl	Fire hydrant Washington & Spruce	42	....	Iron & cement.
3	Spruce . . .	Fire hydrant corner Mulberry	24	....	Iron & cement.
3	Centre . . .	Fire hydrant corner Main	24	....	Iron & cement.
		Total 3-inch pipe		190	
		Total extension in 1863		9,564	Ft. or 1.81 miles

II. Exhibiting All the Pipes Laid to December 31st, 1863.

Diameter of pipes in inches.	24	20	16	10	8	6	4	3	2
Pipes laid previous to 1863...	2,668	10,678	2,608	5,205	11,163	20,339	76,377	4,867	794
Pipes laid in 1863	......	......	......	......	610	1,044	7,720	190	......
Total	2,668	10,678	2,608	5,205	11,773	21,383	84,097	5,057	794
		15,954 feet.					128,309 feet.		

15,954 feet= 3,021 miles of main pipes.
128,309 feet=24,301 miles of distributing pipes.

144,263 feet=27,322 miles of pipes in total.

SCHEDULE B.

I. Showing the Number and Location of Stop-Valves Set in 1863.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	8	Centre	West line of Spruce.
1	8	Centre	West line of Main.
2	8	inch Valves.	
1	6	Franklin	West line of Kentucky.
1	6	inch Valve.	
1	4	Merwin	On bend between British & Columbus.
1	4	German	East line of Merwin.
1	4	Clinton	East line of Kentucky.
1	4	Clinton	East line of Duane.
1	4	Clinton	West line of State.
1	4	Duane	North line of Franklin.
1	4	Duane	South line of Clinton.
1	4	Willey	East line of Pearl.
1	4	Wood	South line of St. Clair.
1	4	Walworth	West line of Miami.
1	4	Detroit	East line of Hanover.
1	4	Marshall	South line of Lake.
1	4	Pearl	North line of Detroit.
1	4	Pearl	North line of Spruce.
1	4	Spruce	South line of Mulberry.
1	4	Spruce	North line of Centre.
1	4	Main	North line of Centre.
1	4	Main	North line of Elm.
1	4	Elm	West line of Second.
1	4	Seneca	South line of Michigan.
1	4	High	East line of Ontario.
1	4	Pearl	North line of Washington.
22	4	inch Valves.	

RECAPITULATION.

Two 8-inch Valves, 1 6-inch Valve, 22 4-inch valves; 25 valves in all.

II. Table Showing the Number of Stop-Valves in Use December 31st, 1863.

Waterway in inches..	24	20	16	10	8	6	4	3	2	Total.
In former years	3	13	4	6	18	36	188	28	3	299
Set in 1863					2	1	22	1		26
Total	3	13	4	6	20	37	210	29	3	325

SCHEDULE C.

Giving Number and Location of Fire Hydrants and Cistern Connections Added in 1863.

No.	STREET.	LOCATION.	SIDE OF ST.
1	Frankort . .	Corner of Bank	North.
1	Merwin . . .	Between British and Columbus.....	West.
1	Franklin . .	Between Kentucky and Harbor.....	North.
1	Detroit . . .	Corner of Hanover.....................	North.
1	Lake	Opposite Marshall	North.
1	Pearl	Corner of Washington	East.
1	Pearl	Opposite Spruce	West.
1	Spruce	Corner of Mulberry	East.
1	Centre . . .	Corner of Main	North.
9	Fire hydrants.		

Street cistern No. 2, at intersection of Duane and Clinton streets, was also connected, making 29 connected street reservoirs.

Reservoir No. 18, at intersection of Ontario and Michigan streets, and reservoir No. 44 at intersection of Lake and Marshall streets, were filled up and a fire hydrant placed there, leaving the total number of street reservoirs, 48.

SCHEDULE D.

I. Showing the Distribution of Water in 1863.

Months.	Gallons distributed.	
	Per month.	Average per day.
1—January	31,104,900	1,003,384
2—February	27,734,400	990,515
3—March	27,100,425	874,208
4—April	22,574,325	752,478
5—May	36,682,275	1,183,300
6—June	41,834,305	1,394,478
7—July	45,549,900	1,469,352
8—August	46,609,200	1,503,523
9—September	39,139,530	1,304,651
10—October	36,431,895	1,175,223
11—November	32,509,275	1,083,643
12—December	33,520,425	1,081,304
	420,790,875	1,152,851

II. Showing the Distribution of Water in Gallons for the Years 1857 to 1863, Inclusive.

Year.	Total consumpt'n per ac.	Average per day.	Increase.
1857	127,262,265	348,664	
1858	142,155,434	389,467	11¾ per cent.
1859	198,234,090	513,107	30 per cent.
1860	260,220.354	710,984	31¼ per cent.
1861	322,175,022	881,599	23¾ per cent.
1862	369,673,092	1,012,794	14½ per cent.
1863	420,790,875	1,152,851	13¾ per cent.

Showing an increase of 13.83 per cent in 1863 over 1862.

1737

ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1864.

REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

For the Year 1864.

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REPORT

OF

Trustees of Water Works.

To the Hon. Mayor and Common Council of Cleveland:

Gentlemen:—The undersigned trustees of the City Water Works submit herewith the Annual Report of their Superintendent and Engineer, which exhibits the condition of the works, and also the operations in their departments during the past year.

The report of the Secretary shows the receipts and expenditures during the same period.

We have examined these reports and find them full and explicit, and anything we may say in addition seems uncalled for; we therefore respectfully submit these reports.

L. M. HUBBY,
PETER THATCHER,
WM. B. CASTLE,
Trustees.

Office of the Water Works, Cleveland, Jan. 30th, 1865.

To the Trustees of Water Works:

Gentlemen:—I herewith submit a statement, showing the receipts and expenditures of money on account of the Water Works for the year 1864.

The gross receipts for water are in excess of 1863, $9,977.61. The disbursements for running expenses are $3,561.30 more this year than last. The amount paid for repairs is in excess of last year $1,117.95. Water rent returns this year are $9.42 more than was returned in 1863. The total amount of excess of running expenses, repairs and returned water rent is $4,668.67.

The net receipts for water are in excess of 1863, $5,288.94. Add to this amount the excess of running expenses, repairs and returned water rent, $4,688.67, making $9,977.61, and deduct therefrom the amount of 25 per cent addition to the water rate from December 1864, viz.: $3,246.35, and we have the increase water rent over 1863, viz.: $6,731.26.

There has been paid for pipe extension $27,409.27; $19,462.26 more than was expended in 1863.

Permits for 135 connections with the distributing pipes were granted in 1863, and in 1864, 121 connections were made.

The assets of the Water Works on the first January, 1864, amounted to $39,779.81, on the first January, 1865, the amount is $32,139.68, being a decrease of $7,640.13.

Water leases not renewed in December, 1864, amount to $647.50. Add 25 per cent, making $809.37.

Respectfully,

GEO. W. GIRTY,
Secretary.

Water Works Office, Cleveland, Jan. 1, 1865.

Cash on hand January 1, 1864, as per Report			$23,243 23
Cash received for water		$33,656 91	
Deduct running expenses	$13,573 26		
Deduct repairs	1,953 49		
Deduct returned water rent	267 42	15,794 17	17,862 74
Cash received to pay interest on Water bonds			$37,100 00
Cash received to pay interest on Water bonds unsold			900 00
Cash received for interest on bills receivable			64 00
Cash received on construction fund account			398 00
			$79,567 97
Cash paid interest on Water bonds		$36,387 50	
Coupons not presented		712 50	
			$37,100 00
Cash paid for pipe extension			27,409 21
Cash deposited in Ocean Bank, N. Y.			900 00
Cash, interest addition to bills receivable			64 00
Cash on hand January 1, 1865			14,094 76
			$79,567 97

LEDGER BALANCES, JANUARY 1, 1865.

DEBITS.		CREDITS.	
Cash	$14,094 76	Water rent	$60,830 82
Construction Fund	2,414 89	Coupons	1,768 40
Pipe extension	79,338 51	Interest and exchange	4,867 61
Ocean Bank	3,819 92	Bonds	35,000 00
Bills receivable	170 00		
Commissions	58 75		
Discount	2,570 00		
	$102,466 83		$102,466 83

ASSETS.

Cash on hand	$14,094 76
Ocean Bank, deposit	2,874 92
Bills receivable	170 00
Bonds unsold	15,000 00
	$32,139 63

ANNUAL REPORT

OF THE

Superintendent and Engineer.

Office of Water Works,
Cleveland, January 1st, 1865.

To the Board of Trustees of Water Works:

Gentlemen:—The Ninth Annual Report upon the operations of the City Water Works during the past year and upon this present condition, is herewith respectfully submitted.

1. INLET TOWER AND AQUEDUCT.

These parts of the works are in good repair. Next spring it will be required to examine them thoroughly again and to attend to such repairs as will be found necessary, in order to keep this important branch of the works in good working condition.

II. ENGINE HOUSE AND LOT.

The engine house will only need the usual repairs and by taking the wornout parts of the brick floors in boiler rooms up and putting new bricks in, will make these floors answer for a year or two more.

By that time the tracks of the A. & G. W. R. W. will be finished, and the necessary side-tracks for the delivery of coal to our bins can be laid, new bins as recommended in last year's report erected, and tracks for the hand-cars from the bins into the boiler houses established; then is the proper time to lay good substantial stone floors in front of the boilers and to make a permanent job of the whole.

III. ENGINES AND BOILERS.

In conformity with the report of the engine man, in charge of the engines, they are both in good working condition.

They required last year the following repairs:

1. Refitting of piston of East engine.
2. New valve check for air-pum
3. New rubber head valve fo
4. Repairing of exhaust val
5. Refitting of steam valve
6. New rubber-beat for lo
7. Bracing of lower pump

The lower valve chamber of east engine pump split at the angle of the perpendicular side and the top. It was deemed best not to take it out, but strengthen the chamber by heavy braces. The arrangement accomplished all that was expected, the chamber is perfectly tight again, and no sign of further fracture has been discovered thus far.

At the same time the west engine was braced in a like manner, and it is thought they will be good and serviceable for several years.

The boilers were thoroughly cleaned, examined, and the masonry around the fire-boxes renewed, and both batteries are now in good condition.

The lower wooden floors and tanks of the engines show already signs of decay, and the cataract floors had to be renewed already during the past year.

It is recommended to provide permanent metal structures in place of these wooden ones, as soon as it becomes necessary to renew them, whereby much trouble will be obviated.

The East Engine run last year	1,269 hours	50 min.
The West Engine run last year	1,578 hours	20 min.
Total running time	2,848 hours	10 min.

The engines were worked 313 days during the past year, the average running time per day being 9 hours 6 minutes, which is an increase over the year 1863 of 43 minutes per day.

Number of strokes of East Engine	681,800
Number of strokes of West Engine	801,425
Total number of strokes	1,483,225

and as each stroke delivers to the reservoir 321 gallons, the entire quantity pumped during the year was 476,114,225 gallons.

Average height above surface of Lake Erie, to which the water was raised	157,313 feet
Average duty of East Engine	37,424,474
Average duty of West Engine	35,588,054

pounds of water raised one foot high with every 100 pounds of coal consumed for raising steam and pumping.

IV. RESERVOIR.

With the exception of a portion of the inside brick pavement, this part of the work is in good condition, and a few thousands of bricks will make this pavement good again for another year.

V. DISTRIBUTION.

The whole pipe system is in good condition. The constant supply of water was never interrupted during the whole year.

The sole serious accident was the bursting of the chamber of the 24-inch gate in front of the reservoir in the rising main. As no other valve was on hand, it was taken out entirely and a piece of 24-inch pipe put in its place.

The 16-inch main, ordered to be laid, was commenced and half of the entire length laid.

Through the difficulty of procuring pipe and labor, the extension of distributing pipes could not be executed as fast as desired, and has to be done during the coming season.

The extension of last year was 11,309 feet, or 2.142 miles; of which the appended Schedule A gives a detailed statement, and also a survey of the whole pipe system.

Schedule B exhibits the number and size of stop-gates set during the year in connection with the pipe extension, with a table showing the whole number and the different sizes of all the stop-gates in use.

Schedule C gives the additional fire hydrants and street cistern connections made in 1864.

Schedule D exhibits the pumping operations of the works during last year, and the consumption of water in the same period. Also, a tabular statement of the increase in the consumption of water from the year 1857 to 1864, inclusive, showing an increase in 1864 over 1863 of 13 1-8 per cent.

New connections with the distributing mains have been made during the past year, as follows:

4 inch connections	1
2 inch connections	1
1½ inch connections	1
1 inch connections	3
¾ inch connections	4
⅝ inch connections	111
Total	121

The entire number of service pipe connections on the last day of December, 1864, was 1,445, which are classified as follows:

4 inch connections	4
3 inch connections	3
2 inch connections	21
1½ inch connections	10
1 inch connections	54
¾ inch connections	123
⅝ inch connections	1,230
Making as above	1,445

VI. GENERAL REMARKS.

The expenditures of last year have been, according to the certified vouchers:

I. RUNNING EXPENSES.

Pay rolls for 12 months ....

Coal ....

Oil, tallow and soap ....

Cotton waste and packing ....

Hardware ....

Plumbing work	98 56
Small stores	12 50
Brass work	147 45
Iron work	55 08
Carpenter work	4 50
Advertising, printing and stationery	189 62
Rent of store room	79 80
Gas fixtures and lamps	11 20
Ice for office	11 50
Painting, papering, etc., in office	111 09
	$13,654 59
Received for sundries	76 33
Net expenditure, running expenses	$13,578 26

II. REPAIRS.

Payrolls for 12 months	$ 787 90
Repairs of machinery and tools	562 38
Lumber and carpenter work	101 10
Hardware	253 85
Mason work	30 12
Paving	3 63
Painting	210 60
Plumbing	5 50
Patterns	40 65
Castings for engines	223 19
Firebricks and clay	47 50
Small stores	10 40
	$ 2,276 82
Received for sundries	370 12
Net expenditure, repairs	$ 1,906 70

III. PIPE EXTENSION.

Pay rolls for 12 months	$ 169 36
Castiron pipes and valve boxes	2,112 07
Iron and cement pipe	23,134 66
Stop gates	1,678 82
Lead	220 61
Plumbing and air cocks	10 50
Coal	6 87
Wood plugs and tan bark	12 75
Packing yarn	41 30
Hardware	33 08
Patterns	308 75
Tools and derrick	102 04
Advertising	20 50
	$27,851 31
Received for sundries	442 10
Net expenditure pipe extension	$27,409 21

IV. CONSTRUCTION FUND.

Received for sundries	$ 402 00
Paid for surveying	4 00
Receipts over expenditures	$ 398 00

The grading and improving of Kentucky street, from Detroit street to Division street in front of engine house lot, is again submitted to your earnest consideration.

The increase of 25 per cent on the tariff of water rates, which has been ordered by you, was added to all water bills in December last and no complaints about this measure come to our knowledge. It is hoped, however, that the prices of material and wages will not increase during the coming year to such an extent, that a further advance in the price of the water should become necessary.

The progress on the new map, which you authorized last spring, is very favorable and it will probably be completed during the coming season.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer.

SCHEDULE A.

I. Showing the extension of Water Pipes in the year 1864.

Diameter of Pipes in Inches	IN WHAT STREET.	BETWEEN WHAT STREETS.	FEET LAID	TOTAL	REMARKS.
16	Franklin	Columbus and Franklin circle	2,430	....	Iron & cement.
16	Franklin Cir.	From former pipe to gate	6	....	Cast iron.
16	Erie	Prospect and Ohio	1,440	....	Iron & cement.
16	Ohio	Erie and Pittsburgh	935	....	Iron & cement.
		Total of 16-inch pipe	—	4,811	
8	Centre	Second and West River	758	....	Iron & cement.
8	Columbus	Franklin and Willey	1,911	....	Iron & cement.
		Total of 8-inch pipe	—	2,669	
6	West River	Detroit and First	1,285	....	Iron & cement.
6	Franklin	Conn. between 16 and 6 pipe	8	....	Cast iron.
6	Franklin	Eastwards from Pearl	10	....	Cast iron.
		Total of 6-inch pipe	—	1,303	
4	Huron	Prospect and Euclid	58	....	Iron & cement.
4	Huntington	Prospect and Garden	842	....	Iron & cement.
4	High	Ontario and Middle	247	....	Iron & cement.
4	Middle	Branches from High	4	....	Iron & cement.
4	Wood	St. Clair and Rockwell	60	....	Iron & cement.
4	Bond	St. Clair and Rockwell	240	....	Iron & cement.
4	Bond	Intersection of St. Clair	47	....	Iron & cement.
4	Clinton	Intersection of State	40	....	Iron & cement.
4	Clinton	Intersection of Kentucky	24	....	Iron & cement.
4	State	Franklin and Detroit	559	....	Iron & cement.
4	Church	Branches from State	4	....	Iron & cement.
4	Kentucky	Intersection of Clinton	17	....	Iron & cement.
4	Second	Branches from Centre	4	....	Iron & cement.
4	First	Branches from Centre	4	....	Iron & cement.
4	Sycamore	Branches from West River	2	....	Iron & cement.
4	Elm	Branches from West River	2	....	Iron & cement.
4	Franklin	Intersection of Columbus	80	....	Iron & cement.
4	Abbey	Branches from Columbus	4	....	Iron & cement.
4	Freeman	Branches from Columbus	4	....	Iron & cement.
4	Willey	Intersection of Columbus	47	....	Iron & cement.
4	Erie	Connection between 16 and 4 pipe	20	....	Cast iron.
		Total of 4-inch pipe	—	2,309	
3	Huntington	For fire hydrant	13.5	....	Iron & cement.
3	High	For fire hydrant	20.5	....	Iron & cement.
3	State	For cistern connection	7	....	Iron & cement.
3	State	For cistern connection	8	....	Iron & cement.
3	Kentucky	For cistern connection	11	....	Iron & cement.
3	Centre	For fire hydrant	16.5		
3	West River	For fire hydrant on foundry	22.5		
3	West River	For fire hydrant on Elm street	31		
3	West River	For fire hydrant furnace	14		
3	Columbus	For fire hydrant on Willey street	22		
3	Columbus	For fire hydrant on Freeman	30		
3	Columbus	For fire hydrant on Hill street	21		
		Total of 3-inch pipe	—	217	
		Total extension in 1864		11,309	Feet, or 2.142 miles.

II. Table showing all the Pipes laid to December 31st, 1864.

Diameter in inches	24	20	16	10	8	6	4	3	2
Pipes laid previous to 1864..	2,668	10,678	2,608	5,205	11,773	21,383	84,097	5,057	794
Pipes laid in 1864	......	......	4,811	......	2,669	1,303	2,309	217	......
Total	2,668	10,678	7.419	5,205	14,442	22,686	86,406	5,274	794
	20,765 feet.			134,807 feet.					

20,765 feet= 3,933 miles of main pipes.
134,807 feet=25,531 miles of distributing pipes.

155,572 feet=29,464 miles in all.

SCHEDULE B.

I. Showing the number and size of Stop Gates set in 1864.

Number.	Waterway in Inches.	LOCATION.	
		Street.	Side of Street.
1	16	Franklin	East line of Columbus.
1	16	Franklin	West line of Russia.
1	16	Franklin circle	West line of York.
1	16	Franklin circle	On branch for main to Fulton street.
1	16	Erie	South line of Eagle.
1	16	Ohio	West line of Pittsburgh.
6	16	inch Stop Gates.	
1	8	Centre	West line of West River.
1	8	Centre	West line of First.
1	8	Centre	West line of Second.
1	8	Columbus	South line of Franklin.
1	8	Columbus	North line of Lorain.
1	8	Columbus	North line of Freeman.
1	8	Columbus	South line of Willey.
7	8	inch Stop Gates.	
1	6	West River	Northwest line of West River.
1	6	West River	On connection to 20-inch main.
1	6	West River	South line of Sycamore.
1	6	West River	North line of Centre.
1	6	Franklin	On connection between 16 & 6 in. pipe.
5	6	inch Stop Gates.	
1	4	Huntington	North line of Garden.
1	4	High	East line of Middle.
1	4	Bond	South line of St. Clair.
1	4	State	North side of Clinton.
1	4	State	South side of Clinton.
1	4	Franklin	East line of Columbus.
1	4	Franklin	West line of Columbus.
1	4	Willey	West line of Columbus.
1	4	Erie	On connection between 16 & 4 in. pipe.
9	4	inch Stop Gates.	

RECAPITULATION.

6 16-inch stop gates.
7 8-inch stop gates.
5 6-inch stop gates.
9 4-inch stop gates.
—
27 stop gates in all.

II. TABLE.

Exhibiting the Number and Sizes of all Stopgates in use December 31st, 1864.

Waterway in inches..	24	20	16	10	8	6	4	3	2	Total.
Gates set previously to 1864	3	13	4	6	20	37	210	29	3	325
Gates set in 1864	......	......	6	......	7	5	9	3	......	30
Total	3	13	10	6	27	42	219	32	3	356
Taken up in 1864	1	......	......	......	......	......	......	......	......	1
Balance	2	13	10	6	27	42	219	32	3	354

SCHEDULE C.

Giving Number and Location of Fire Hydrants and Street Cistern Connections added in the year 1864.

No.	STREET.	LOCATION.	SIDE OF ST.
1	Huntington ..	Opposite Fire Engine House	East.
1	High	Corner Middle	South.
1	Centre	Corner First	South.
1	West River ..	Corner Foundry, opposite Superior street..	West.
1	West River ..	Corner Elm	West.
1	West River ..	In front of Cuyahoga Furnace	East.
1	Columbus	Between Franklin and Lorain	West.
1	Columbus	Corner of Freeman	West.
1	Columbus	Corner of Willey	West.
9	Fire hydrants in all.		

Street reservoirs Nos. 1, 3 and 4 were also connected, making 32 reservoirs connected and supplied from the Water Works, their whole number being 50.

SCHEDULE D.

I. Showing the Distribution of Water in 1864.

Months.	Gallons Distributed.	
	Per Month.	Average per day.
January	33,151,275	1,069,396
February	32,196,300	1,110,217
March	33,801,300	1,090,365
April	32,565,450	1,085,515
May	35,342,100	1,140,068
June	50,116,125	1,670,537
July	49,851,300	1,608,106
August	48,687,675	1,570,570
September	40,325,625	1,344,187
October	38,993,475	1,257,854
November	40,558,350	1,351,945
December	40,525,250	1,307,266
Total	476,114,225	1,300,858

II. Exhibiting the Distribution of Water, in gallons, for the years 1857 to 1864 inclusive.

Year.	Total Consumption per Annum.	Average per Day.	Increase.
1857	127,262,265	348,664	
1858	142,155,434	389,467	11.70 per cent.
1859	198,234,090	513,107	39.45 per cent.
1860	260,220,354	710,984	31.27 per cent.
1861	322,175,022	881,599	23.81 per cent.
1862	369,673,092	1,012,794	14.74 per cent.
1863	420,790,875	1,152,851	13.83 per cent.
1864	476,114,225	1,300,858	13.14 per cent.

1906

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1906

ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1865.

REPORT

OF THE

BOARD OF TRUSTEES

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For the Year 1865.

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ASTOR, LENOX AND
TILDEN FOUNDATIONS
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Report of Prof. Cassels.

To the Trustees of the Cleveland Water Works:

Gentlemen:—Joseph Singer, Esq., Superintendent and Engineer of the City Water Works, in conformity with your instructions to him, engaged me to make a careful and thorough chemical analysis of the water with which the city is supplied. Also to institute a series of experiments to determine as near as practicable, the effects of the water on lead and galvanized iron pipes, and its relative value for steam purposes.

As the result of these analyses and experiments, I respectfully present the following

REPORT.

The water is taken from Lake Erie and forced into a reservoir situated on the high land on the west side of the Cuyahoga river—the inlet pipe being also on the west side of the mouth of the river—from which it is distributed to the different parts of the city.

The main distributing pipes are cast iron, the smaller ones sheet iron, coated with water-lime cement, while the connecting supply pipes are generally lead or iron, terminated in the dwellings with brass or composition stop-cocks. As it is required of all who take water to connect with the main street pipe by a certain number of feet of lead pipe of the same size of their supply pipe, the water of each consumer must necessarily pass through lead, whatever kind of supply pipe he may select, before it reaches the place of its consumption.

In order to arrive at the real chemical character of the water, and any changes which it may have undergone in the course of its distribution, the specimens submitted to examination were taken both from the lake and also from different localities of the city.

One specimen submitted to analysis, and other examinations.
was taken from the "inlet tower," where the water
supply pipe leading to the force pump, to be th
the reservoir. This inlet is one mile from the mou
hoga river, and four hundred and fifty feet fro
water was carefully taken from a depth of fou
surface, by means of sinking clean earthen ju
ner as to exclude all surface water. This is
1 in the report.

No. 2. Was taken from the stop-coc
Weddell House Hotel, on the second floor

it is being constantly used for drinking purposes. This water is carried there from the street pipe through the usual lead connection, and iron and lead tubes, soldered together with common plumbers' solder, and terminated with a composition stop-cock. The Weddell House is about a mile east from the reservoir.

No. 3. Was taken from a common hydrant, situated on the street level, at the Cleveland Medical College building, corner of Erie and St. Clair streets, about a mile and a half east of the reservoir. This hydrant has the general lead connection with the street pipe, the balance being iron pipe to the outlet, terminated by a common iron screw stop-cock.

No. 4. Was taken from the distributing pipe in my residence on Euclid avenue, corner Case avenue, which is about three miles east of the reservoir. The water is conveyed from the street pipe to the house, through the connecting lead pipe, the balance, iron pipe; with some lead pipe connecting the outlet stop-cock with the iron pipe.

No. 5. Was obtained from the lake, about three thousand feet lakeward of the present inlet tower, from a depth of four feet beneath the surface.

This distance from the shore extends beyond the point where the turbid water produced by its erosive action on the shore, generally reaches. There, the water is usually clear and transparent. But it is very difficult to determine the exact bounds of this action and condition of the water; depending entirely on the state of the weather. At this distance, however, it is purer, a much larger part of the time, than at the present inlet. The reason for analyzing the water, from this point, was to determine its relative purity with the present supply—chemical and mechanical—with the object in view of considering the propriety of ultimately removing the supply inlet to this distance from the shore.

The physical properties of these different samples of water differed but little from each other, except that those taken from places the most distant from the reservoir, were the clearest; that from the inlet tower having the largest amount of sedimentary matters.

They all, except No. 5, when first obtained, were more or less opalescent, depositing a whitish sediment and becoming clear after remaining some time at rest. No. 1 contained the most and No. 4 the least of these matters, while No. 5 was entirely free from them.

These sedimentary matters were collected and chemically examined. They were found to consist principally of clay, with a small percentage of silex, intermixed with a minute portion of vegetable matters.

The relative amount of these matters was determined, by passing a gallon of water, from each of the specified localities, through a double filter of the best Swedish filtering paper—the filters being carefully counterbalanced previous to filtration. The filters and their contained matters were dried at a temperature of 212 deprees F. till a constant weight was obtained, and weighed.

A gallon of No. 1 contained	5.652 grains.
A gallon of No. 2 contained	1.604 grains.
A gallon of No. 3 contained	1.485 grains.
A gallon of No. 4 contained	0.802 grains.
A gallon of No. 5 contained	nothing.

Had these specimens been all collected at the same time, the result of the above examination would have been somewhat more satisfactory, in exhibiting the effects of the water's action on the lake shore, its powers of transporting into the lake these suspended matters, the time required for their deposition, and the amount deposited in the inlet pipe, the reservoir and the distributing pipes. But a close approximation to these points is obtained, for with the exception of No. 1, which was collected on the 19th of February, the others were all obtained within a short time of each other. The time of the collection of No. 1 readily accounts for the great amount of its sediment, being more than a true yearly average.

The result exhibits, in an interesting manner, the effects of quietude in the separation of these matters from water, and the necessity of frequent cleaning of the main pipes, which, otherwise, would soon become unfit for their office. Happily the nature of these matters is such, that the main pipes can, at any time, be thoroughly cleaned by means of washing currents. In fact, this is apparent to all who have ever witnessed the muddy state of the water which first issues from the street hydrants, when used for extinguishing fires, or for other purposes.

The amount of these matters must necessarily vary with the condition of the weather. When the lake is much agitated with storms, its erosive action on the shore is much increased, charging the returning waves with a larger quantity of silt, and carrying it further into the lake than during calms. This is the reason that the city supply varies so much in appearance, for, notwithstanding the great care with which the inlet pipe is guarded against the entrance of impure water, frequently the turbid water extends far beyond the inlet, rendering it absolutely impossible to obtain water free from these silty matters.

During these agitations of the water, a large quantity of the suspended matters are, of course, deposited in the inlet pipe before it reaches the pumps, and a still larger proportion of it finds a bed in the reservoir; but there is, nevertheless, enough that remains in the water until it reaches the supply pipes of the city, producing in it an unpleasant and milky appearance. The amount of these matters, however, even in the worst stages of the water, in this respect, is so trifling, that it cannot be regarded as in the smallest degree deterient to the animal economy, while the fastidious can readily remove them by simple mechanical filtration.

This unsightly turbidity may be entirely obviated by an extension of the inlet pipe to the distance from which specimen No.

5 was taken, although, even here, during heavy storms, occasional silty visits might be expected. It might also, to a great extent, be modified by allowing the water to remain in the reservoir long enough to allow these matters to be deposited. But there are some very serious objections to this, the chief of which is ,that it would give origin to an accumulation of those cryptogamic plants and animalculae peculiar to stagnant water, which would be much more injurious to health than the small amount of inorganic matters that now occasionally mar the natural limpidity of the waters of Lake Erie.

Water is a solvent of very extensive powers, both of solids, liquids and gasses. Hence when it falls on the earth in the form of rain or snow—which are very close approximations to pure water—it dissolves and becomes charged with a large proportion of all those organic and inorganic matters with which it comes in contact, and in its percolation through the strata, it becomes more and more impregnated, till it issues in the form of springs. Hence the endless variety of natural waters, constituting hard and soft waters, mineral springs, etc., their characteristics depending on the chemical character of the rock formations, and subordinate strata through which they have passed. The geological character of a country, in which lakes and streams are situated, must therefore greatly modify the chemical constitution of their waters. In primitive regions, where the rocks, and their derivative soils, are chiefly granitic, the water is generally purer, and characterized as soft, containing the soluble salts of potash and soda in large proportion to its other constituents; while that of a limestone country—especially our western limestones, from the great quantity of carbonic acid derived from vegetable decomposition, rendering the limestone soluble by its presence—is designated as hard, having a large percentage of the salts of lime and magnesia, rendering it much less valuable for a great many purposes.

The shores of the upper end, or southwest portion of Lake Erie, together with its numerous islands, located in that region, are limestone. The natural downward current, sweeping through among these islands, must necessarily become more or less charged with lime and magnesia. Moreover, the large streams emptying into the lake, in this region, pass through the same limestone formation. This limestone, too, contains from twenty to forty-five per cent of magnesia. Hence, we may reasonably expect both lime and magnesia in the waters of Lake Erie, in the vicinity of Cleveland.

The degree of hardness, thus produced, sustains an interesting relation to the value of water for a great many purposes; especially in the generation of steam as a motor power, and many manufacturing operations—subjects in which Cleveland is largely interested.

The incrustations formed in the interior of steam boilers, so dangerous and destructive in their effects, are composed mostly of the sulphate of lime and the carbonates of lime and magnesia.

These carbonates are nearly insoluble in pure water, but are readily soluble in water containing an excess of carbonic acid gas. This gas, thus combined, is easily expelled by heat; hence water, holding these salts thus in solution, when boiled, loses its carbonic acid, and deposits them as insoluble carbonates. These, now mixing the sparingly soluble sulphate of lime, adhere with great tenacity to the inside of the boiler.

The compactness of these incrustations is very much influenced by the relative proportion of the sulphate. The greater its quantity the more compact and hard the deposit. Where there is but little of this sulphate, the deposit is comparatively loose and muddy, and is readily removed by the process of "blowing out." The compact or loose nature of these incrustations, then, will very much depend on the relative proportions of these three substances, modified by the amount of heat used in the generation of the steam. The higher the temperature, the greater the deposit of the sulphate, even while falling far short of dryness, from evaporation. These deposits are also very much influenced by the presence of other matters; thus, some of the chlorides increase, while others diminish, the solubility of the sulphate of lime; thereby very much modifying the nature of the incrustation. The chloride of sodium (common salt) increases its solubility, while that of magnesium and calcium tend to diminish it.

It ought to be more generally known by those engaged in steam operations than it is, that heat alone possesses a great influence on the solubility of the sulphate of lime, and consequent modification of steam boiler deposits. Thus, it has been determined, by direct experiments, that above 212 degrees F. its solubility rapidly diminishes with an increase of temperature. At 255 degrees F. it is lessened about three-fourths, and it is entirely insoluble in water at 300 degrees F. According to Bucholz, sulphate of lime requires 460 parts of water at 60 degrees for solution. Thus it is certainly very evident, that the chemical character of the substances held in solution in water, sustain an exceedingly interesting relation to the generation of steam, both in respect to the durability of the boilers, and the safety of those engaged in its operations.

To ascertain, by direct experiment, the effects of continued boiling, with the escape of the steam, on our city water, in reference to the formation of incrustations and their character, two quarts, taken from the hydrant near the college, were boiled down, in a suitable glass vessel, to about a quarter of its quantity. On cooling, no change could be observed, except a slight opacity; no deposit of any kind was thrown down. Three gallons were afterwards boiled down to about a pint, and allowed to cool. This gave a hard incrustation of a compact rusty colored calcareous character, adhering with great tenacity to the sides of the vessel.

From these experiments I infer, that long continued boilin
of large quantities of this water, in steam boilers, will give ri
to incrustations of a highly deleterious character, unless prevent
ed by frequent "blowing out." And perhaps among all the plans

devised and recommended for the prevention and removal of these deposits, that of frequent and thorough clearing out the boilers, is the most reliable—whether the waters deposit a loose or compact sediment.

Sometimes it is desirable to ascertain by some simple, yet reliable process, the relative degree of hardness of natural waters; thereby indicating their value for steam and many other practical purposes. What is termed the "soap test" affords, when properly conducted, a very satisfactory approximation to the truth. This consists in adding a small quantity of a saturated alcoholic solution of fine hard white soap to distilled water; this will simply be changed to a delicate milky or opalescent color, and on agitation will give rise to frothy bubbles. The same treatment of a hard water, results in a curdy white precipitate, without bubbles or froth,—the harder the water the greater the deposit of curdy matters, and vice versa.

By the soap test the waters of Lake Erie, at Cleveland, may be ranked as hard water, but in a low degree. Thus, if pure distilled water is taken as one, and very decidedly hard water as ten, then this water would rank as two. As a base of comparison, the Croton water of New York, would, by this scale, be classed as one and a half.

In the following analyses the United States standard gallon was adopted; and the solid matters contained in the water are reduced to the number of grains in the gallon. I have preferred this arrangement because it is, at present, generally used in this country, in weighing and measuring other solids and liquids, and consequently better understood by those most interested in such results.

The United States gallon contains 231 cubic inches, or 58,318 grains of pure water, at a temperature of 60 degrees F., and Bar. 30 inches. Great care was taken in measuring the water, and having it at the proper temperature during its measurement.

The method pursued, in the varied operations of determining the relative amount, character and chemical relations, of the forign matters held in solution in the water, is mainly that of Fresenius, as given in the last edition of his valuable work on quantitive analysis. The water was all carefully filtered previous to concentration; by which means everything was removed that was simply mechanically mixed or suspended in it.

Perhaps it may be proper to state, in this connection, that the different substances found in the water were not separated and weighed in the characters in which they are expressed in the detailed formulæ of the report, although they doubtless are so arranged in the water. With the exception of the silica they were all obtained and weighed in some of their combinations with other substances, whose numerical relations are well established and their weight determined by calculations, based on the relations which the elements of a compound sustain to each other. This method, always adopted by analytical chemists, when properly carried out, affords the most satisfactory results. By it the weight of a substance can be ascertained which is infinitely too minute to be separated and determined by the balance in an uncombined state.

Without pretending to enter into a very minute description of all the minutiæ of the processes followed out in the detailed analyses, it may, however, be more satisfactory to state the leading points in these processes.

1st. The silica, oxide of iron, alumina, lime, and magnesia, were determined by acidulating a gallon of the water with chlorohydric acid, and evaporating to dryness—first in a porcelain and subsequently in a platinum vessel. This was dissolved in chlorohydric acid, boiled in distilled water and filtered to remove the silica; which was weighed, after drying and ignition. The oxide of iron and alumina were precipitated from the filtrate by ammonia, and removed by filtration. The alumina was separated from the iron by potash and carbonate of ammonia, and weighed separately after drying and ignition. The lime was thrown down from the filtrate by oxalate of ammonia and liquid ammonia, while hot; and after remaining two days, to settle, it was repeatedly washed with hot distilled water, redissolved by chlorohydric acid, and again precipitated with ammonia, filtered, dried, ignited and weighed as a carbonate. The filtrate was concentrated by evaporation and the magnesia separated by phosphate of soda and ammonia, and weighed, after ignition, as the phosphate of magnesia.

2nd. The sulphuric acid was obtained as the sulphate of baryta, by acidulating a gallon of the water with chlorohydric acid, concentrating it, by slow evaporation, to about half a pint, and adding, while boiling hot, the chloride of barium; and the sulphuric acid calculated from the weight of the washed, dried and ignited sulphate of baryta.

3rd. The chlorine was determined from the weighed chloride of silver, obtained by rendering a gallon of the water distinctly alkaline with the carbonate of soda, evaporating it to about half a pint, acidulating with nitric acid, and adding a solution of the nitrate of silver.

4th. The presence and amount of potash and soda were ascertained by slowly evaporating, by a moderate heat, two gallons of the water to about half a pint, and carefully filtering. The filtrate was treated with chloride of barium, and again filtered, and the filtrate boiled with milk of lime, and after cooling, again filtered. This filtrate was boiled with carbonate of ammonia and liquid ammonia, to which was added a little oxalate of ammonia, by which all the lime might be entirely removed. After filtration, it was evaporated to dryness, and ignited in a platinum vessel, to expel all traces of ammonia. The chlorides of potassium an sodium thus obtained were separated and determined in the usu way by the bichloride of platinum.

5th. The amount of free carbonic acid was determined driving it off from a quart of the water by heat, and passin into lime-water, and subsequently calculating the amount from the resulting carbonate of lime.

6th. Phosphates and Nitrates.—Neither of these could be detected by the most delicate and reliable tests, in any of the specimens, even when largely concentrated,—for which purpose two gallons of the water was slowly and carefully evaporated down to half a pint.

7th. Organic Matters.—To ascertain the relative amount of organic matters associated with the inorganic, a gallon of the water, after filtration, was evaporated to dryness, first in a porcelain basin and finished in a counterpoised platinum vessel at a temperature of 212 degrees F., and kept at that temperature until a constant weight was obtained, and weighed. This gave the weight of both the organic and inorganic substances. After thorough ignition, which burned off all the organic matters, it was again weighed; the loss indicating the weight of the organic matters. In order to make this result perfectly reliable, the inorganic matters thus obtained were moistened with a solution of the carbonate of ammonia and dried at 250 degrees F., and repeated until a constant weight was obtained, and again ignited, and weighed.

8th. Distribution of Acids and Bases.—In this the common method was adopted. The principle, that at present guides chemists in the hypothetical associations of the acids and bases, found in natural waters, is to assume that the combination of the bases and acids is governed by their respective affinities; i. e., the strongest acids are assumed to be combined with the strongest bases, etc. Although the solubility of these salts must necessarily influence these affinities, yet in the distribution adopted in this report, this is entirely disregarded. On this principle chlorine was given first to potassium and then to sodium. In the distribution of sulphuric acid the same rule was observed; first to potassa, then soda and lime. The residue of the lime and the magnesia were reckoned as simple carbonates.

Carrying out in detail this arrangement of substances found in the water, by the processes thus cursorily described, a gallon of each of the different specimens of water acted upon, was found to contain as follows,—in grains:

	No. 1	No. 2	No. 3	No. 4	No. 5
Chloride of potassium	0.080	0.080	0.080	0.078	0.086
Chloride of sodium	0.190	0.180	0.180	0.185	0.190
Sulphate of potassa	0.125	0.025	0.025	0.086	0.090
Sulphate of soda	0.047	0.025	0.030	0.040	0.185
Sulphate of lime	2,575	2.475	2,470	2,470	2,476
Carbonate of lime	1.175	1.150	1.160	1.160	1.165
Carbonate of magnesia	0.650	0.520	0.500	0.480	0.488
Peroxide of iron	0.021	0.025	0.030	0.040	0.038
Alumina	0.057	0.100	0.060	0.060	0.058
Silica	0.080	0.070	0.100	0.082	0.030
Organic matters	1.800	1.750	1.740	1.740	0.640
Total	6.800	6.400	6.375	6.371	5.440
Free carbonic acid, in cubic inches	6.145	6.000	5.875	5.675	6.400

A comparative estimate of the character of our city water, may be made from the following table of the solid matters existing in a United States gallon of the water used in other cities. It has not been deemed necessary to insert here, for this purpose, the full detail of the different substances found in these waters, but simply the number of grains of solid matters in the gallon.

The Croton river water in New York contains	6.6600
The Schuylkill river water in Philadelphia contains	4.2600
The water of Long pond of Boston contains	1.2220
The water of the Ohio river, used in Cincinnati, contains	6.7361
That of the Detroit river, used in Detroit, contains	6.3343
That of the Onondaga Hill spring, used in Syracuse, contains	40.0000
The water of Lake Erie, used in Cleveland, contains	6.4865
That of Lake Erie, a mile and a half from the shore at Cleveland	5.4400
That of Loch Katrine, used in Glasgow, contains	2.1500
That of the river Dee, used in Aberdeen	4.0000

In its sanitary relations, there is no subject connected with the supplying a city with water, next to its abundance and purity, in which the citizens are more generally and directly interested, than that of the mode of its distribution, in order to maintain its original purity. And here the subject of the action of these waters on lead, sustains an exceedingly important relation; because this metal is so generally used, and in so many different ways, in connection with water works, on account of the ease with which it is adapted to the various contrivances for its conveyance and distribution; and because it is more or less soluble in all waters, in some of its chemical relations; while its effects on the human organism, thus introduced, are slow and insidious, but at the same time so certainly deleterious.

As early as the time of Augustus Caesar the Roman architects condemned the use of lead for either conveying or holding water, to be used in culinary operations, on account of compounds being formed which were regarded as baneful to the human system. Galen reprobated, in the strongest terms, the use of lead pipes for carrying water. He said, it rendered the water unsightly and muddy, and those who used it were subject to attacks of the severest form of colic, and the most uncontrollable and fatal forms of dysentery.

Since then to the present time physicians and chemists have given this subject a vast amount of both chemical and medical attention, without arriving at any definitely fixed conclusion. There are several important points, however, on which nearly all agree, as being fixed and determined scientific truths. Thus most medical men agree as to the manner of action, on the human system, of the different compounds of lead, and their peculiar poisonous effects. Little discrepancy obtains among them, on their accumulative powers. That is, it is generally acceded, that the salts of lead may be taken into the system, in very minute quantities and for a length of time, lie dormant, without any unpleasant effects being manifested, but suddenly become developed with great virulence and even fatal effects,—without increasing the quantity.

Chemists are generally of the opinion, that lead is much more readily acted upon by some waters than by others; and the purer the water the greater and more rapid this action. They also generally suppose, that the presence of certain soluble salts in the water prevents the action of the water on the lead, from their assistance in forming a coat of an insoluble salt of lead on its surface. Some eminent chemists, however, maintain that even then, enough of these lead compounds are produced to prove hurtful to those who use the water. And moreover, that some persons are much more susceptible to this lead action than others.

It is also generally conceded by chemists that those waters deemed the most desirable for city purposes are the most subject to lead contamination; i. e., the purer the water the greater its effects on lead.

Without taking any part in this interesting controversy, I have deemed it only necessary to cite a few experiments made by Prof. Christison on different waters, and his conclusions drawn therefrom; with those I have made with our city water.

Prof. Christison says: "Distilled water deprived of its gases by ebullition, and excluded from contact with the air, has no action whatever on lead. If the water, however, contains the customary gases, in solution, the surface of the metal, freshly polished, becomes quickly dull and white. But if the surface of the water be not at the same time exposed to the air, the action soon comes to a close. When the air, on the other hand, is allowed free access to the water, a white powder appears in a few minutes on and around the lead; and this goes on increasing till in the course of a few days there is found a large quantity of white matter, which partly floats in the water, but is chiefly deposited on the bottom of the vessels. If the air is deprived of its carbonic acid, this white substance is the hydrated oxide. But if the surface of the water is exposed to the open air, a pale grayish powder is produced, which is the carbonate of lead."

He adds: "The formation of the carbonate takes place with considerable rapidity." He found that polished lead rods weighing 340 grains lost two grains and a half in eight days, when placed in twelve ounces of distilled water, in a shallow glass basin, loosely covered to exclude the dust. He also obtained 120 grains from an ounce of lead kept in twenty-four ounces of distilled water, for twenty months.

During these corrosions he ascertained that some of the lead is held in solution, and he is of the opinion that the lead is first oxidized and subsequently becomes the carbonate.

It is generally conceded by chemists, that this corroding action on lead is very much modified by the presence of certain salts in the water; but to what extent this protective power exists, and to what extent it can confidently be relied upon, are still undecided questions. Guyton Morreau was probably the first whose attention was directed to this subject, from observing that while distilled water acted on lead no such changes were produced by certain natural waters. On further testing, he found that those springs, and river waters, containing sulphate of lime, and chloride of sodium, corroded lead but little, but increased its weight. From a series of experiments he concluded that water containing a five hundredth of sulphate of lime possessed no corrosive action whatever.

Christison, from his experiments, concludes that this protective power varies with different salts; the most effectual being the sulphate of lime, in conjunction with chloride of sodium. He says: "After a few weeks exposure of lead to waters containing these salts, it acquires a thin film, over its surface, which wholly guards against any further corrosion. In all such protecting solutions the lead gains weight for some weeks; but at length it ceases to undergo further change. This coating when once formed adheres with great firmness. Moreover, the most careful examination can not detect any lead, either dissolved in the water, or floating in it, or united with the insoluble matters left on the side of the glass by evaporation. In short, the preservation of the lead from corrosion, and of the water from impregnation with lead, is complete."

Although these experiments were made with the utmost care, by that eminently reliable chemist, yet it must be acknowledged, that the subject is not free from doubts, when applied practically on a large scale. Moreover, it is well known that when lead, either in sheets or pipes, has been for some time exposed to the action of air and water, it assumes a semicrystalline texture, rendering its whole substance easily permeable to their united action, causing chemical changes which could not be obtained in laboratory experiments.

It must be a somewhat difficult task to determine with certainty, even by adopting Christison's rule; that there are protective salts in our natural waters, in the proper quantities to prevent entirely their action on lead. And especially must this be the case, when these pipes are in metallic connection with iron or brass, as they generally are, in distributing pipes, which, by their electrical relations, must necessarily modify this action.

From the subjoined statement of the late Dr. James R. Chilton, the well known analytical chemist, of New York, it appears that the Croton water of that city does not act as a protective: "Some months after the introduction of the Croton water into our city, my attention was called to investigate its action upon the lead pipes which were to carry it into dwelling houses, &c. In several instances I detected lead in the water which had stood in lead pipes over night, in situations where free use w [illegible] made of the water during the day, and in some instances [illegible] daily use had continued several weeks. I have also found n [illegible] quantities of lead in the Croton water which I drew from [illegible] pipe in the third story of a house, at least a year after t [illegible] had been in the house. This water had probably remain [illegible] pipes for more than a week. Subsequent to this, I mad [illegible] of experiments with a view to determine the action of Croton water upon the pipes made of pure lead, and of alloys of tin and lead, and also of those made of lead coated with pure tin. These pipes, of some thirty or forty feet in length, were filled with water brought in a cask from the Croton river. The water was displaced from the pipes by admitting a fresh supply at intervals of a day or two, for three weeks; and that which escaped was tested each time. That which passed through the lead pipe always contained lead; while that from the pipe made from the alloy of tin and lead, as also that from the pipe coated with tin, inside and outside, did not contain a particle of lead, but for the first few days yielded a trace of tin." To which he adds: "It is possible that the water in passing rapidly through a lead pipe of moderate length, in constant use, may not become so impregnated with lead as to be injurious to health." It may be proper to add that the pipes referred to by Dr. Chilton had been constantly used for several months.

Dr. Dana found lead in the water of the Merrimac river after passing through lead pipes, in the city of Lowell, Mass Dr. Hayes has detected lead in the waters of Jamaica pond drawn from the lead pipes in Boston, which had been in use several years as service pipes. This water ought to act as a protective, in an eminent degree, as it contains the reputed protective salts in large quantities.

It may safely be stated that all river and lake waters manifest an action more or less on lead—the purer the water the greater the action, all other things being equal. This action may possibly diminish with time, but it is highly probable that it never entirely ceases as long as the pipes are in use for the purpose of conveying the water.

The following examinations and experiments were made on the Lake Erie water distributed in our city, in reference to its action on lead. A gallon of the water, taken from the Weddell House office, was evaporated at a temperature of 180 degrees F. to four ounces, and tested for lead. Two ounces of this had a stream of sulphydric acid gas passed into it. The other two ounces were filtered, acidulated with nitric acid, and evaporated to dryness. After expelling the excess of nitric acid by heat, it was dissolved in distilled water, and divided into three equal parts; sulphydric acid gas was passed into one, solution of iodide of potassium into another, and the chromate of potash into the third. Neither of these tests gave indications of lead. A similar examination, with the same result, was made on water taken from the second story of my residence on Euclid avenue. This was drawn in the morning, when the water had lain in the pipes ten or twelve hours. In other examinations, made at different times, and on water collected at different localities, in the city, I have in every instance failed to detect lead.

In order to determine the effects of lead on our city water, when allowed to remain in contact with it, three bars of common lead, thoroughly cleaned and polished were placed in three glass vessels filled with water. These bars weighed respectively 154.5 grains, 160. grains and 170.5 grains. Each vessel contained four measured ounces of water, taken from the hydrant near Cleveland Medical College. The vessels were loosely covered to exclude dust. Two hours after immersion they all lost their shining white lustre and became of a dull bluish hue. On the fifth day, they all presented a dull gray color; when No. 1 was taken out, dried with bibulous paper and weighed; it had not changed in weight, and no lead could be detected in the water. On the seventh day No. 2 was weighed; it had gained 0.015 grains and a mere trace of lead was indicated in the water. On the tenth day No. 3 had scarcely changed in appearance, and when weighed it had lost 0.025 grains in weight and the water gave strong evidence of the presence of lead. Immediately after weighing this bar, without cleaning, it was placed in the vessel with fresh water from the same hydrant, and remained in it for eighteen days, when it was found to have neither changed in color, nor weight, and no traces of lead could be discovered in the water.

520.5 grains of common lead pipe, were soldered to a brass stop-cock and immersed in a half pint of water taken from the same hydrant. This pipe was not cleaned except to remove, by washing, any loose matters that might have been attached to it. Two days after, a portion of the water was tested for lead, but no indications of it could be found. Twelve days after, a portion of the water was again tested, when very slight indications of lead were observed. After remaining in the water three weeks another portion of it was tested, with a result almost identical with the last examination. In four weeks from the time of its being first placed in the water, it was dried and weighed, when it had lost 0.752 grains, and the water was found to be highly charged with lead.

From these experiments, and others of a similar character, followed by similar results, it is very certain that the city water will act on lead under certain circumstances, while its protective action is of a very doubtful character, and can not with much certainty be relied on. But its corrosive action is of exceedingly slow progress, requiring a much longer time of contact, to produce the same effect, than either the Croton of New York, the Schuylkill of Philadelphia, or the Cochituate of Boston. And, it may be added, that in the general arrangement of the distributing pipes adopted in Cleveland, little danger need be apprehended from the presence of lead. Nevertheless, the less lead pipe used, the less liability to the deleterious effects of its corrosive action; and it ought to be generally known, that some constitutions are extremely susceptible to the baneful effects of the salts of lead, requiring but very minute quantities to produce the most grave consequences, and there are no means of determining the amount necessary to produce these sad effects, short of the most painfu and hazardous experiments.

A series of experiments were also made, to determine, near as possible, the action of the water on galvanized iron. The object of these, was to ascertain what might be the result in using galvanized iron pipes to convey the water from the main pipe to the dwellings of the consumers. It is well known that galvanized iron is simple iron coated with zinc; which from their electrical relations protects the iron from corrosion. This protection of the iron, however, is at the expense of the zinc, which is thus rendered more easily acted upon by solvent agents than it would be if not thus associated with the iron.

Although the salts of zinc are not generally ranked among the more virulent metallic poisons, yet they are undoubtedly exceedingly injurious to the human constitution. Their continued use, even in minute quantities, is followed by a series of ailments which may not be immediately fatal, but ultimately result in very serious sequences.

These effects of zinc were demonstrated to a sad degree, a few years ago, in Lancashire, England, from the use of zinc milk pans in butter making. It was found that the cream separated more readily in zinc than in tin pans, as the zinc combined with the acid of the milk as soon as formed. But this salt of zinc found its way into the butter, and almost every person who used it was taken sick of a disease of a peculiar type. Many of these cases proved fatal. An analysis of the butter revealed the cause of this peculiar and widespread sickness. The public authorities, when the cause was ascertained, interfered and prohibited the use of zinc milk pans under a severe penalty.

The zinc commonly used for galvanizing iron is of a very inferior quality. A large proportion of it being old zinc; which of course is much mixed with other metals, such as lead, antimony, brass, &c., all of which contribute largely to the formation of soluble salts in the water. But even new zinc is seldom free from these impurities. Hence, even the best of galvanized iron pipes, met with in market, must necessarily endanger the formation of soluble salts, both of zinc and other metals, which may be neither safe nor pleasant to the consumer of the water conveyed through them.

In order to test this matter by direct experiment, 1211.95 grains of new galvanized iron chain, such as that used in the common chain pump, were put into a pint of water taken from the hydrant near the College, in a glass beaker, loosely covered to exclude dust. In twenty-four hours the water was of a bluish white color and tasted distinctly of the salts of zinc. In three days a whitish sediment was observed collecting on the zinc, which was easily detached by agitation. After remaining a week in the water a large deposit of the carbonate of zinc was formed, and the water was strongly impregnated with the chloride of zinc. Traces of lead were also detected in the water, derived probably from the lead impurities of the zinc. The links had decreased in weight 1.04 grains, and were heavily coated with the carbonates of zinc and iron.

From foregoing described experiments, I am very much inclined to the opinion that both lead and galvanized iron pipe should be, as much as possible, discarded for service pipe in our city. Although the water, when constantly flowing through either of these pipes, may not become contaminated, yet when remaining in them a sufficient length of time there can be no question on the subject; and as it is very difficult to set exact bounds to the length of time required to produce these effects, their use must always be attended with more or less risk. To avoid all such risk, and allay all suspicion of this kind, perhaps no better material can be used than a good quality of iron pipe. The carbonate and oxide of iron, at first produced by the water, will very soon combine with the clay and silex of silty matters of the water, and form a hard smooth lining which will both protect the iron from further oxidation and afford a channel for the water, wholly devoid of everything that can in the least contaminate it in its passage. The outside may be protected by a coating of coal tar from the gas works, or water lime cement. Iron pipes are in many respects preferable to the more expensive ones of tin or tinned copper, on account of the difficulty of obtaining these metals pure when manufactured for such purposes. Wooden pipes might in many instances be advantageously used, or those made wholly of water lime. But there are objections to all of these which do not in the least militate against those of iron.

All of which is respectfully submitted.

J. L. CASSELS, Prof. of Chemistry.

REPORT

OF THE

TRUSTEES OF WATER WORKS

Cleveland, O., March 16, 1866.

To the Hon. Council of the City of Cleveland:

Gentlemen:—The undersigned, Board of Trustees of W Works, present herewith the Tenth Annual Report of their Su intendent and Engineer upon the conditions of the City W Works, and their operations during the year 1865; and also yearly Report of the Secretary.

Both documents are explicit and fully demonstate the ministrative acts of the Board for the past year, making any ditional elaborate Report of the Trustees unnecessary.

Recommending these reports to your consideration, we s scribe

Respectfully,

PETER THATCHER,
W. B. CASTLE,
W. BINGHAM,
Board of Trustees of Water Work

REPORT

OF THE

Secretary of Water Works.

Water Works Office,
Cleveland, Jan. 1st, 1866.

To the Trustees of the Water Works:

Gentlemen:—The following is a statement of the receipts and disbursements on account of the Water Works for the year 1865:

Cash on hand Jan. 1, 1865			$14,094 76
Cash received for water		$41,019 63	
Deduct running expenses	$17,346 56		
Deduct repairs	1,382 21		
Cash deduct returned water rent	131 62	18,860 39	22,159 24
Cash received to pay int. on Water Bonds			38,000 00
Cash received for bills receivable and int. thereon			175 95
Cash received on Construction Fund account			3 78
Cash received on Pipe Extension account			75 35
Cash received of Ocean Bank, deposit			3,191 72
			$77,700 80
Cash paid, interest on Water Bonds			$37,505 00
Cash paid for pipe extension			29,265 64
Cash deposited in Ocean Bank, N. Y.			900 00
Cash on hand Jan. 1, 1866			10,030 16
			$77,700 80

The following Table exhibits the receipts and payments from the year 1856 to 1865 inclusive, to which you are referred for the comparative amounts thereof during that time.

H. C. HAWKINS,
Secretary.

Years.	Receipts for Water Rents.	Running Expenses.	Repairs.	Returned Water Rents.	Net Earnings.
1856 to 1859 inc.	$ 34,688 76	$29,845 49	$ 2,996 08	$ 160 03	$ 1,687
1860	16,987 66	7,683 80	1,734 38	194 06	[illegible]
1861	17,384 91	7,768 36	1,350 84	287 84	
1862	23,125 88	8,086 19	1,291 29	395 35	
1863	23,679 30	10,011 96	835 54	258 00	
1864	33,656 91	13,573 26	1,953 49	267 42	
1865	41,019 63	17,346 56	1,382 21	131 62	
Totals	$190,543 05	$94,315 62	$11,543 83	$1,[illegible] 54	

REPORT

OF THE

Superintendent and Engineer

OF

WATER WORKS.

Office of Water Works.
Cleveland, January 1, 1866.

To the Board of Trustees of Water Works:

Gentlemen:—In submitting his Tenth Annual Report upon the City Water Works, for the year ending December 31st, 1865, your Superintendent and Engineer begs leave to call your attention to the several distinct parts of the Works as follows:

I.—INLET TOWER AND AQUEDUCT.

At the inspection of that part of the works, whence the supply of water is obtained, it was found, that the iron fastenings of the trap-doors on Inlet-tower and one of the doors were stolen during the past summer. The opening is now temporarily covered with boards; next spring a new door has to be made and the fastenings should be secured in a similar way to those of the air-hole covers of the Aqueduct, which can only be opened by a person knowing how and where they are fastened.

The stone filling between the spiles of the Inlet-tower requires an additional hundred perch of stone.

Should the unusual low state of the water in Lake Erie continue until spring, a second iron band should be laid on around the Inlet-tower, about four feet below the first one, to give additional strength to this structure.

Last December, when the ice on the Lake was sufficiently strong to work on it in safety, the strainers on the Inlet were taken out for examination; the inner one was perfectly sound and clean, the outer one had a broken frame-piece, for which a new one was substituted, the strainers cleaned and both put back to their places.

The Aqueduct has to be pumped out next season for the purpose of close inspection, thorough cleaning and effectual repairs.

The air-hole covers are partly decayed, and as the street under which the Aqueduct is constructed, is now used as a public highway, new covers have to be made.

II.—ENGINE HOUSE AND LOT.

The building requires the following repairs:

1st. Painting of roofs.

2d. Painting outside doors and windows.

3d. Painting inside woodwork and walls.

4th. Repairing ceilings and stairs.

5th. Additional chains for iron chimney.

6th. Placing iron sills on front doors.

7th. Railings between cylinders and walls to prevent visitors from coming too close to the working parts of the engine.

8th. New wood floors around the hot wells.

9th. Repairing of floors beneath lower valve chambers.

10th. Repairing of cold water tanks.

11th. Entire new pointing with cement on the outside of the brick walls, as the old mortar is washed out badly.

III.—PUMPING ENGINES AND BOILERS.

The Engineer in charge of the Engines reports both in good working order. On the 14th of December the lower valve-chamber of the West Engine gave way near its door in such a place, that a cure similar to the one resorted to last year on the East Engine could not be thought of. Heavy wrought gripes were made and shrunk on. This expedient proved successful, and the Engine is now working again as well as before. The necessity of having at least one of the Pumping Engines in perfect order, commands that new valve-chambers should be made and prepared for immediate use, should any further fracture of the old ones occur.

To guard against similar accidents in future, a different design for these parts of the Engines was made, the quantity of metal, about 25 per cent., increased, and the parts most apt to break altered in form. It is confidently believed that the strength of chambers made in conformity with this design will be at least double that of the old ones.

After due consideration, these plans were adopted, and an order for a new valve chamber for West Engine was given to the builders of the engines—the Allaire Works, in New York—and which will be put in its place as soon as delivered.

The following repairs have been made on the Engines during the past year:

1st. A new set of steel valve-rods in upper steam-chest of West Engine, and refitting of steam-valves.

2d. A new cast guard and new rubber valve for t pump piston of East Engine.

3d. New refitted valves and seats for both main upper valve chambers.

One of the furnace plates on the easterly boiler c gine is considerably blistered; this has to be cut out and a new plate put in early next Spring.

During the least year 517,261,005 gallons of water wer pumped, showing an increase of 41,146,708 gallons over 1864.

The Engines worked during the past year 311 days; th average running time per day being nine hours thirty-three min utes, which is an increase of twenty-seven minutes per day ove the previous years.

Number of strokes of East Engine	835,52
Number of strokes of West Engine	775,88
Total number of strokes	1,611,40

Average height above surface of Lake Erie to which th water was raised, 158,017 feet.

Duty of East Engine	37,441,7
Duty of West Engine	35,778,4

pounds of water raised one foot high with every 100 pounds coal consumed for raising steam and pumping.

This duty is calculated by the Cornish method, and no d duction made for ashes and cinders.

The accompanying Schedule, A., exhibits the performan of the engines in 1865, and Schedule B, a tabular statement their aggregate performances since the commencement of t operations of the Works.

IV.—RESERVOIR.

This part of the Works is in good repair. The figures the scale boards have to be repainted, so that they can be re from the terrace. The wooden stairs leading to the top of t Reservoir are so much decayed that no attempt should be ma to repair them, and it is earnestly recommended to your consi eration to substitute an entire new flight of stone steps, as e perience has shown that wooden stairs are of short duration this place.

Every year is the turf of the Reservoir embankments mo or less injured by the thoughtless practice of visitors of runnir down on the corners of the slope, and by boys sliding down t embankments on the snow. The corners are newly sodded eve year, and as regularly destroyed again. It is, therefore, recon mended to employ a man, whose duty it shall be to be constant on the premises, and to bring offenders before the proper cou for punishment; he could devote his time to the keeping of t Reservoir—to mowing, weeding, cleaning, and such repairs will be required from time to time.

By these means the Reservoir could be kept in proper trir and we would not need to feel ashamed when strangers visit th place, and their remarks, that in the West such a Public Inst tution could not be kept in order, would cease to be made.

V.—DISTRIBUTION.

The entire pipe system is in good order, and the increase supply through the new main, as far as completed, is materially felt. The balance of this main should be laid early next Spring.

During the past season 13,329 feet or 2-522 miles of new pipes were laid, making the total length of pipes now in use nearly thirty-two miles. The location, size and length of pipes laid in 1865 are shown in the appended schedule (C), which gives also a general survey of the whole pipe system in the City.

Schedule (D) exhibits the number and size of stopgates set during the year in connection with the pipe extension, and also a table showing the whole number of stop gates now in use, and their different sizes.

Schedule (E) gives the additional Fire Hydrants and Street Reservoir connections made in 1865.

Schedule (F) shows the monthly and the average daily consumption of water in the past year, and the totals and averages of all the previous years. In this schedule the annual increase of consumption since the introduction of the Lake water will also be seen, showing for 1865 an increase of 8.64 per cent. over 1864

New connections with the distributing mains were made during the past year as follows:

1 inch connections	4
3-4 inch connections	13
5-8 inch connections	142
Total,	159

The entire number of service pipes connecting on the last day of 1865 was 1604, which are classified as follows:

4 inch connections	4
3 inch connections	3
2 inch connections	21
1 1-2 inch connections	10
1 inch connections	58
3-4 inch connections	136
5-8 inch connections	1372
Making as above in all	1604

The waste of water during the winter season is necessarily very fast, and we are compelled in several instances to turn the water off on premises where hydrants were found running constantly; but the larger number, who waste water in this way, cannot be detected, as they do it at night, when the reasonable hours of the by-laws have expired.

The adoption of meters, for at least all large consumers, is again earnestly recommended as one safeguard against waste. As a further provision against waste, it should be ordered by the Board of Trustees that during the coming summer all premises, where water from the City Water Works is used, shall be inspected, and the owners or occupants requested to provide their service-pipes with accessible stop water-cocks for turning th water off during cold nights, and on their refusal to comply wi this request to discontinue the sale of water to such premises.

The use of street-washers on the sidewalks for any other purpose than washing sidewalks and windows, or sprinkling streets, should be entirely prohibited, as they have become a real nuisance, and more water is stolen therefrom than taken by persons entitled to its use.

Both, the Water Works as well as the consumers, would be gainers by these rules, and the constant freezing and bursting of service-pipe would be prevented as much as the great waste of water.

VI. GENERAL REMARKS.

The expenditures for last year have been, according to the certified vouchers, as follows:

1.—RUNNING EXPENSES.

Pay rolls for 12 months	$ 10,184 79	Carpenter work	$ 2 00
Coal	5,966 63	Advertising, printing and stationery	133 75
Oil, tallow and soap	405 47	Rent of store room	125 00
Hemp packing	68 40	Ice for office	8 00
Hardware	123 67	Whitewashing	5 00
Plumbing work	55 58	Small stores	49 53
Brass work	223 01		
Iron work	30 72		
		Total	$ 17,381 55
Received for sundries			39 38
Net expenditures, "running expenses"			$17,342 17

2.—REPAIRS.

Pay rolls for 12 months	$ 988 57	Paving	$ 6 24
Repairs of machinery and tools	224 25	Trees for reservoir lot	56 00
Lumber and carpenter work	78 69	Fire brick and clay	22 00
Brass work	12 50	Small stores	115 35
Bricks and cement	161 15		
			$1,664 75
Received for sundries			338 64
Net expenditures "repairs"			$1,326 11

3.—PIPE EXTENSION.

Pay rolls for 12 months	$ 2,066 94	Paving	$ 19 37
Cast iron pipes and valve boxes	12,380 56	Advertising	93 80
Iron and cement pipes	11,893 73	Carpenter work and lumber	102 39
Stop gates	1,662 00	Iron work	197 34
Lead	469 78	Brass work	87 00
Plumbing	128 12	Tools	38 00
Coal and wood	56 34	Meters	29 00
Wood plugs	7 52	Small stores	9 00
Packing yarn	24 75		$ 29,265 64
Received for sundries			171 27
Net expenditures, "pipe extension"			$29,094 37

4.—CONSTRUCTION FUND.

Received for sundries	$58 98
Paid for carpenter work	55 20
Net receipts, "Construction Fund"	$ 3 78

The entire cost of the Water Works to December 31st, 1865, amounts to $618,381.68, as follows:

1.	Cost of construction to December 31st, 1858	$518,731 88
2.	Construction and pipe extension in 1859	25,098 06
3.	Construction and pipe extension in 1860	4,108 72
4.	Construction and pipe extension in 1861	3,727 87
5.	Construction and pipe extension in 1862	3,647 02
6.	Construction and pipe extension in 1863	7,964 34
7.	Construction and pipe extension in 1864	27,011 21
8.	Construction and pipe extension in 1865	29,092 59
	Total as above	$619,381 68

The means for the payment of this amount were derived, firstly, from the sale of City Water Works bonds to the amount of $550,000.00, and the balance with $69,381.88 was obtained from the surplus of the earnings of the Works,—after paying running expenses and repairs,—and leaving on the last day of December, 1865, an available cash fund of $25,613.36 at the disposal of the Board.

As you are well aware, the interest on the Water Works Loan is paid from the General Fund; but the City at large is amply reimbursed for this expenditure by the free use of the water for all Public Buildings, Fountains, School Houses and the Fire Department.

Calculating these items at the regular rates for water rents, would give the Water Works an income from the City of nearly $40,000.00 per annum, thus proving that the City, by providing for the payment of the coupons on the Water Works Bonds, is but paying a fair price for the use of the water for City purposes.

The correctness of this calculation may be judged from the fact that the City of Buffalo, for instance, pays every year $36,000.00 to the Water Works for the use of water for the Fire Department.

Viewing the future and prosperity of the Water Works in this light, it is apparent that the surplus revenue derived from the sale of water,—after paying running expenses and repairs,—being appropriated to the extension of the system of water pipes, brings an abundant supply of water every year from 2 to 5 miles further, thereby giving 200 to 800 more house sor families an opportunity to supply themselves with this great preserver of health and happiness.

The increase of the value of these Works from this source amounts already to one-eighth of the entire Water Works Loan, without taking into consideration the cash balance on 1
should no unforeseen casualty require an unusual o
for repairs, the extension of the pipes can be
same ratio without making any additional loan

All of which is respectfully submitted.

JOSE
Superinten

SCHEDULE A.

ENGINE RECORDS FOR 1865.

EAST ENGINE.

Months.	Pum'g Hours.	Pum'g Minutes.	Strokes.	Coal Consumed for Raising Steam.	Coal Consumed for Pump'g.	Coal Consumed for Total.	Gallons Water Pumped.	Hight Feet. Dec'mls.	Dut
January	164	35	89,400	18,600	93,400	112,000	28,697,400	158.574	33,978,
February	98	00	55,050	11,200	55,600	66,800	17,671,050	159.187	35,216,
March	113	55	63,350	13,200	63,000	76,200	20,335,350	158.822	35,445,
April	108	25	59,000	13,000	52,600	65,600	18,939,000	158.201	38,195,
May	135	20	73,875	12,200	64,000	76,200	23,713,875	158.060	41,136,
June	108	10	59,725	6,400	53,200	59,600	19,171,725	157.364	42,332,
July	134	35	73,300	11,600	66,000	77,600	23,529,300	157.397	39,911,
August	138	50	77,650	10,400	64,600	75,000	24,925,650	157.395	43,745,
September	122	10	68,350	10,600	62,800	73,400	21,940,350	157.381	39,341,
October	113	10	64,400	10,400	63,800	74,200	20,672,400	157.638	36,728,
November	143	05	80,225	14,600	85,000	99,600	25,752,225	158.374	34,244,
December	126	45	71,200	15,400	75,400	90,000	22,855,200	158.616	33,388,
Total and Averages	1507	00	835,525	147,600	799,400	947,000	268,203,525	158.084	37,441,

WEST ENGINE.

Months.	Pum'g Hours.	Pum'g Minutes.	Strokes.	Coal Consumed for Raising Steam.	Coal Consumed for Pump'g.	Coal Consumed for Total.	Gallons Water Pumped.	Hight Feet. Dec'mls.	Dut
January	46	35	26,100	4,800	27,600	32,400	8,378,100	158.124	34,194,
February	107	20	55,400	14,400	60,600	75,000	17,783,400	159.034	31,535,
March	92	50	49,850	11,400	50,800	62,200	16,001,850	158.631	34,128,
April	89	30	45,250	10,800	47,000	57,800	14,525,250	158.366	33,282,
May	107	30	54,675	10,750	48,750	59,500	17,550,675	157.680	38,896,
June	196	00	106,825	14,800	106,400	121,200	34,290,825	157.445	37,252,
July	161	55	82,125	15,000	80,800	95,800	26,362,125	157.255	36,188,
August	176	30	96,375	12,800	93,600	106,400	30,936,375	157,466	38,288,
September	145	05	77,000	11,800	80,000	91,800	24,717,000	157.458	35,454,
October	145	50	77,950	15,000	80,200	95,200	25,021,950	157.702	34,663,
November	95	05	51,075	7,000	49,600	56,600	16,395,075	158.049	38,286,
December	100	30	53,255	10,800	54,800	65,600	17,094,855	158.191	34,474,
Total and Averages.	1464	40	775,880	139,350	780,150	919,500	249,057,480	157.950	35,778,

SCHEDULE B.

AGGREGATE ENGINE RECORDS FOR ALL YEARS FROM THE COMMENCEMENT.

EAST ENGINE.

Years.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped	Hight		Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet.	Decml's.	
1857	693	35	231,354	118,850	235,225	354,075	73,626,095	158.000		29,684,192
1858	524	15	197,486	107,850	190,725	298,575	62,847,939	156.533		31,202,484
1859	668	15	300,064	111,750	262,050	373,800	95,420,352	155.896		35,329,535
1860	999	20	453,318	142,600	377,050	519,650	144,154,124	156.499		36,276,689
1861	1066	45	509,785	131,550	415,900	547,450	162,111,630	156.424		38.690,736
1862	1224	15	603,407	142,206	572,693	714,899	191,883,426	156.410		35,102,083
1863	1187	35	605,475	132,788	559,500	629,288	194,357,475	156.693		36,788,845
1864	1269	50	681,800	126,456	643,068	769,524	218,857,800	157.348		37,424,474
1865	1507	00	835,525	147,600	799,400	947,000	268,203,525	158.084		37,441,769

WEST ENGINE.

1857	512	50	168,540	107,350	172,100	279,450	53,636,170	158.000		28,321,942
1858	630	40	249,238	124,200	239,500	363,700	79,307,495	156.533		31,704,166
1859	744	45	323,691	121,300	287,550	408,850	102,813,738	155.958		36,065,129
1860	811	45	364,985	116,150	330,900	447,050	116,066,230	156.434		34,137,118
1861	1040	50	503,344	133,050	438,250	571,300	160,063,392	156.440		36,405,441
1862	1122	50	559,087	134,640	542,434	677,074	177,789,666	156.304		34,317,546
1863	1187	35	605,475	132,788	559,500	692,288	194,357,475	156.693		36,788,845
1864	1578	20	801,425	148,288	802,500	950,788	257,256,425	157.278		35,588,054
1865	1464	40	775,880	139,350	780,150	919,500	249,057,480	157.950		35,778,436

TOTAL AND AVERAGES OF BOTH ENGINES TOGETHER FOR EACH YEAR.

Years.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped	Hight		Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet.	Decml's.	
1857	1206	25	399,894	226,200	407,325	633,525	127,262,265	158.000		29,003,067
1858	1154	55	446,724	232,050	430,225	662,275	142,155,434	156.533		31,453.325
1859	1413	00	623,755	233,050	549,600	782,650	198,234,090	155.927		35,697,332
1860	1811	05	818,303	298,750	707,950	966,700	260,220,354	156,466		35,206,903
1861	2107	35	1,013,129	265,600	854,150	1,118,750	322,175,022	156.432		37,548,089
1862	2347	05	1,162,494	276,846	1,115,127	1,391,973	369,673,092	157.357		34,720,024
1863	2590	30	1,310,875	281,903	1,169,418	1,551,321	420,790,875	156.693		35,535,438
1864	2848	10	1,483,225	274,744	1,445,568	1,720,312	476.114,225	157.313		36,410,146
1865	2971	40	1,611,405	286,950	1,579,550	1,866,500	517,261,005	158.017		36,621,770

SCHEDULE C.

I.—Showing the Extension of Water Pipe in the Year 1865.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
16	Ohio	Canal and Stone's Levee	1,202.0		Cast iron.
16	Girard	Scranton ave. and Washington st.	490.0		Cast iron.
		Total 16-inch pipe	—	1,692.0	
10	Prospect	Perry and Case avenue	4,336.0		Iron & cement.
		Total 10-inch pipe	—	4,336.0	
8	Central Way.	Connec. bet. 16 in. and dist. main	7.0		Cast iron.
8	Stone's Levee	Connec. bet. 16 in. and dist. main	7.0		Cast iron.
		Total 8-inch pipe	—	14.0	
6	Kinsman	Connec. bet. 16 in. and dist. main	10.0		Cast iron.
6	Ohio	At intersection of Kinsman	15.0		Cast iron.
6	Hudson	Euclid and Prospect	448.0		Cast iron.
6	Hudson	North line Prospect, southward	53.0		Iron & cement.
6	Case avenue	Euclid and Prospect	448.0		Cast iron.
6	Case avenue	North line Prospect, southward	47.0		Iron & cement.
6	Scranton ave.	Connec. bet. 16 in. and dist. main	7.0		Cast iron.
6	West River	West River and Main	1,030.0		Cast iron.
		Total 6-inch pipe	—	2,058.0	
4	*Brownell	Intersection of Prospect	42.0		Cast iron.
4	Brownell	Prospect and Ohio	835.0		Iron & cement.
4	Spruce	Center and Elm	71.0		Iron & cement.
4	Elm	Cedar and Main	117.0		Iron & cement.
4	Kinsman	Longworth and Willson avenue	3,900.0		Iron & cement.
4	Pittsburgh	Liberty and Irving	168.0		Iron & cement.
4	Irving	Pittsburgh and Kinsman	441.0		Iron & cement.
4	Rockwell	Bond and Erie	481.0		Iron & cement.
4	Rockwell	Intersection of Erie	43.0		Cast iron.
4	Freeman	Columbus and Brainard	196.0		Iron & cement.
4	Summer	German and French	174.0		Cast iron.
4	Canal	Vineyard and Michigan	130.0		Cast iron.
4	West River	Main and Spruce	479.0		Cast iron.
4	Miami	Wallworth and Eagle	126.0		Iron & cement.
4	Miami	Connection to former pipe	5.0		Cast iron.
		Total 4-inch pipe	—	7,207.0	
3	Brownell	Fire hydrant bet. Prospect and Ohio	28.5		Iron & cement.
3	Brownell	Cistern connection at Ohio	10.0		Iron & cement.
3	Columbus.	Cistern connection at Abbey	5.5		Iron & cement.
3	Prospect	3 fire hyd. bet. Hudson and Case av.	56.0		Iron & cement.
3	Elm	1 fire hydrant corner of Spruce	9.0		Iron & cement.
3	Kinsman	5 fire hyd. bet. Forest & Willson av.	110.0		Iron & cement.
3	West River	2 fire hyd. bet. W. River and Main	50.0		Cast iron.
			—	269.0	
		Total extension in 1865		15,576.0	
		Deduct pipes taken out in 1865			
7	Prospect	Perry and Judson	1,729.5		
4	Ohio	Intersection Kinsman 15			
4	Hudson	Euclid and Prospect 502	517.0		
		Total deduction	—	2,246.5	
	Leaving a net	balance of extension in 1865		13,329.5	or 2.522 miles.

SCHEDULE C—Continued.

II. Table Exhibiting all the Pipes Laid to December 31, 1865.

Diameter in inches	24	20	16	10	8	6	4	3	2
Pipes laid previous to 1865	2668	10,678	7,419	5,205	14,442	22,686.0	86,406	5,274	794
Laid in 1865	....	......	1,692	4,336	14	2,058.0	7,207	269	...
Total	2668	10,678	9,111	9,541	14,456	24,744.0	93,613	5,543	794
Taken up in 1865	....	......	.....	.....	......	1,729.5	517	.....	...
Balance	2668	10,678	9,111	9,541	14,456	23,014.5	93,096	5,543	794
		22,457				146,444.5			

22,457.0 feet, or 4.253 miles of supply mains; and
146,444.5 feet, or 27.736 miles of distributing mains.

168,901.5 feet, or 31.989 miles in all.

SCHEDULE D.

I. Showing the Number and Location of Stop Gates Set in 1865.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	16	Ohio	**East line of Central way.**
1	16	Ohio	**West line of Stone's levee.**
1	16	Girard	**East line of Scranton avenue.**
3	16	inch gates.	
1	10	Prospect	**Midway between Perry and Huds**
1	10	Prospect	**West line of Hudson.**
1	10	Prospect	**East line of Hudson.**
1	10	Prospect	**Midway between Hudson & Case**
1	10	Prospect	**West line of Case avenue.**
5	10	inch gates.	
1	8	Central way	**On cor. between Main and dist. pip**
1	8	Toledo	**On cor. between Main and dist. pip**
2	8	inch gates.	
1	6	Kinsman	**On cor. between Main and dist. pi**
1	6	Hudson	**North line of Prospect.**
1	6	Hudson	**South line of Euclid.**
1	6	Case avenue	**North line of Prospect.**
1	6	Case avenue	**South line of Euclid.**
1	6	Scranton avenue	**On cor. between Main and dist. pi**
1	6	West River	**West line of First.**
7	6	inch gates.	
1	4	Brownell	**South line of Prospect.**
1	4	Brownell	**North line of Ohio.**
1	4	Elm	**West line of Spruce.**
1	4	Irving	**East line of Pittsburgh.**
1	4	Rockwell	**West line of Erie.**
1	4	Freeman	**West line of Columbus.**
1	4	Summer	**South line of German.**
1	4	West River	**East line of Main.**
1	4	Kinsman	**East line of Longworth.**
1	4	Kinsman	**East line of Forest.**
1	4	Kinsman	**West line of Case avenue.**
1	4	Kinsman	**East line of Park.**
1	4	Kinsman	**West line of Willson avenue.**
1	4	Kinsman	**East line of Willson avenue.**
14	4	inch gates.	
1	3	Brownell	**Cistern connection at Ohio street.**
1	3	Columbus	**Cistern connection at Abbey stree**
2	3	inch gates.	

RECAPITULATION.

3 16-inch gates	14 4-inch gates
5 10-inch gates	2 3-inch gates
2 8-inch gates	—
7 6-inch gates	33 stop gates in all.

SCHEDULE D—Continued.

II. TABLE.

Exhibiting the whole number of Stop gates in use December 31st, 1865.

Water way in inches	24	20	16	10	8	6	4	3	2	Total.
In former years	2	13	10	6	27	42	219	32	3	354
In 1865			3	5	2	7	14	2		33
Total	2	13	13	11	29	49	233	34	3	387
Taken out in 1865						2	1			3
Balance	2	13	13	11	29	47	232	34	3	384

SCHEDULE E.

Giving Number and Location of Fire-Hydrants and Street Reservoir Connections Added in 1865.

No.	STREET.	BETWEEN WHAT STREETS.	SIDE OF ST.
1	West River	Opposite First	North side.
1	West River	Corner of Main	South side.
1	Brownell	Corner of alley next to Prospect	East side.
1	Prospect	Hudson street and Case avenue	South side.
1	Prospect	Hudson street and Case avenue	North side.
1	Prospect	Hudson street and Case avenue	South side.
1	Elm	Corner of Spruce	South side.
1	Kinsman	Corner of Forest	South side.
1	Kinsman	Putnam and Case avenue	North side.
1	Kinsman	Corner of Case avenue	South side.
1	Kinsman	Corner of Park	North side.
1	Kinsman	Between Park and Sawtell	South side.

*12 Fire Hydrant connections in 1865.
167 in former years.

179 Fire Hydrants in the city for use of the Fire Department.

*The connection of these hydrants are made ready to put the hydrants in next spring, as they were not ready at the time the pipes were laid.

Street Reservoir No. 39, at intersection of Brownell and Ohio streets, and Street Reservoir No. 9, at intersection of Columbus and Abbey streets, were also connected, making 34 Reservoirs connected with the Water Works.

SCHEDULE F.

I. Showing the Distribution of Water in 1865.

Months.	Gallons Distributed.			
	Per Month	Av'g per day	Each in. per day.	E'ch con. per day.
January	37,075,500	1,195,984	18.40	103.54
February	35,454,450	1,266,230	19.48	109.63
March	36,337,200	1,172,164	18.03	101.48
April	33,464,250	1,115,475	17.16	96.58
May	41,264,550	1,331,114	20.48	115.25
June	53,462,550	1,782,085	27.41	154.29
July	49,891,425	1,609,401	24.76	139.34
August	55,862,025	1,802,001	27.72	156.01
September	46,657,350	1,555,245	23.93	134.65
October	45,694,350	1,474,011	22.67	127.62
November	42,147,300	1,404,910	21.61	121.63
December	39,950,055	1,288,711	19.83	111.58
Total and Average	517,261,005	1,417,153	21.80	122.70

II. Totals and Averages for all years since Commencement.

Year.	Gallons Distributed.				Per cent. of Increase.
	Per Year.	Av'g per day	Each in. per day.	Each con. per day.	
1857	127,262,265	348,664	7.75	110.68	
1858	142,155,434	389,467	8.37	93.44	11.70
1859	198,234,090	513,107	11.31	91.27	39.45
1860	260,220,354	710,984	14.11	101.57	31.27
1861	322,175,022	881,599	16.32	114.50	23.81
1862	369,673,092	1,012,794	19.47	120.57	14.74
1863	420,790,875	1.152,851	20.97	117.63	13.83
1864	476,114,225	1,300,858	21.68	123.89	13.14
1865	517,201,005	1,417,153	21.80	122.70	8.64

REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

For the Year 1866.

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REPORT

OF

Trustees of Water Works.

To the Honorable, the Mayor and Council of the City of Cleveland:

The undersigned, in submitting the Annual Report of the Superintendent and Secretary of Water Works, beg leave to direct your attention to a few points of special interest—and first in importance, the fact that the new main crossing the river at the intersection of Ohio street, is now fully completed, and in successful operation, thus affording additional security against a failure in supply of water from the reservoir upon the West Side to the territory upon the East. If we reflect for a moment, that previous to October of the past year, the supply for the territory embraced within the city limits upon the east side of the river has been limited to a single main, some portions of which was laid in a treacherous soil, and crossing the river at a point liable to be interfered with by vessels passing up and down, more frequently than at any other point—and the further consideration that the largest proportion of the wealth of the city would be exposed to imminent hazard of destruction by fire, in case of interruption to the only main, and without any adequate resource for water to extinguish the same, to say nothing of the distress and inconvenience, to private consumers, now almost entirely dependent upon the Water Works for daily necessity, the Board feel assured that you will appreciate the feeling with which they congratulate you upon immunity from danger in this direction, and will justify the wisdom of their action in the large expenditure for this purpose.

Two other matters stand out prominently as necessities, in the report of the Superintendent: First, an increase of reservoir, or storage capacity for water for distribution; secondly, the remote possibility of extension of inlet pipe (or under-lake tunnel), to secure purity of the water now occasionally tainted by petroleum; the residuum from the oil refineries located on our river and streams adjacent, and thence carried into the lake.

In regard to the first proposition—increase of reservoir capacity—the necessity therefor is based upon the fact that we have now only storage for a supply of four days, a time too limited (in case of serious accident to inlet-pipe, aqueduct or engine) to make repairs—accidents to which we are always subject in some degree. The plan of duplicate engines and duplicate mains for distribution, sanctioned as wise expedients to provide against these hazards, are incomplete without additional Reservoir capacity; and as such a work requires, as estimated by the Engineer, about three years to complete, while the increased consumption of our thriving city and rapidly increasing population daily diminishes our capacity to supply, for the period of time mentioned, in case of accident, viz; four days, the Board of Trustees would regard themselves as culpably derelict to duty, should they fail to urge your honorable body to take the necessary steps to submit the question of authorizing an additional loan of not less than $200,000.00, to the qualified voters of the city, at the earliest practicable time, in accordance with the statute in such cases made and provided, to provide for additional reservoirs, pipe-extension, etc.

In reference to the second proposition, the Board reiterate the hope expressed in the Superintendent's Report, that the contemplated extension of the west pier of the harbor, and a due and rigid enforcement of the ordinances to prevent pollution of the lake, river and adjacent streams, may secure the water from pollution heretofore occasionally apparent; and if increased reservoir capacity is secured, the Board feel assured that by giving more time for the clay sediment to deposit in same, the purity when distributed will be observed.

Finally the Board cannot too earnestly urge upon your honorable Body the duty of cherishing this, our most important public work. Sensible of the propriety and necessity of the most rigid economy in every item of municipal expenditure, we are sure that no interest of municipal legislation is worthy of higher consideration, than that of furnishing our citizens with a permanent and abundant supply of pure water. All of which is respectfully submitted.

W. B. CASTLE,
W. BINGHAM,
JOHN F. WARNER,
Trustees.

REPORT
OF
Secretary of Water Works.

Water Works Office,
Cleveland, January 1, 1867.

To the Trustees of the Water Works:

Gentlemen: The following is a statement of the receipts and expenditures on account of the Water Works, for the year 1866:

RECEIPTS.

Received for water	$45,519 47
Received from City Treasurer to pay interest on bonds	38,000 00
Received on Pipe Extension account	977 69
Cash on hand, January 1, 1866	10,030 16
	$94,527 32

EXPENDITURES.

For running expenses	$14,277 13
For repairs	8,818 77
For returned water rent	155 77
For pipe extension	32,616 73
For interest on temporary loans	161 55
For construction	111 38
For cash forwarded to Ocean Bank, to pay interest on bonds	37,100 00
For Cash forwarded to Ocean Bank, as deposit	900 00
For cash on hand (in office), January 1, 1867	385 99
	$94,527 32

The following table exhibits the aggregate yearly receipts and various expenditures of the Water Works, from the time of the introduction of water into the city, until the present date:

YEARS.	Receipts for Water.	Running Expenses	Repairs.	Returned Water Rent.	Net Earnings.
1856 to 1859 inclusive	$34,688 76	$29,845 49	$2,996 08	$160 03	$ 1,687 16
1860	16,987 66	7,683 80	1,734 38	194 06	7,375 42
1861	17,384 91	7,768 36	1,350 84	287 06	7,978 65
1862	23,125 88	8,086 19	1,291 29	395 35	13,353 05
1863	23,679 30	10,011 96	835 54	258 00	12,573 80
1864	33,656 91	13,573 26	1,953 49	267 42	17,862 74
1865	41,019 63	17,346 56	1,382 21	131 62	22,159 24
1866	45,519 47	14,277 13	8,818 77	155 77	22,267 80

Respectfully submitted,

H. C. HAWKINS,
Secretary.

ELEVENTH ANNUAL REPORT

OF THE

Superintendent and Engineer

OF

CLEVELAND WATER WORKS.

Office of Water Works,
Cleveland, Jan. 1st, 1867.

To the Board of Trustees of Water Works:

Gentlemen: In presenting his Annual Report upon last year's operations, and present condition of the City Water Works, the undersigned respectfully calls your attention to the following statements, in relation to the several distinct parts of the works:

1. INLET TOWER AND AQUEDUCT.

In conformity with the recommendations of last year's report, the Aqueduct was thoroughly cleaned, repaired, and new substantial stone covers placed over the air-holes.

The Aqueduct is now in as good order again, as can be expected of a structure built in such treacherous ground as that in which the Aqueduct is located.

The accumulation of sediments on the bottom of the Aqueduct, twenty inches deep near the lake shore, diminishing towards the engine-house to about ten inches. Throughout the whole length of the Aqueduct, these sediments consisted chiefly of fine lake sand and clay.

The operation of cleaning was rather slow, partly on account of not having a proper pump for the removal of the contents of the Aqueduct, and partly on account of the insufficiency of our Reservoir, which would only permit of two days intermission in pumping.

Since the Water Works are in operation, the purity of the lake water was always appreciated by the consumers, and no complaint was ever heard about its unfitness for domestic purposes until last February, when the usual colorless water of Lake Erie had a yellowish tint, and a strong scent and taste of petroleum. This alarming matter was immediately and thoroughly investigated, and the following special report upon this occurrence submitted to you:

Office of Water Works,
Cleveland, March 1st, 1866.

SPECIAL REPORT OF THE SUPERINTENDENT AND ENGINEER UPON THE QUALITY OF THE WATER OF LAKE ERIE AT THE PRESENT TIME.

To the Trustees of Water Works:

Gentlemen: Some four weeks ago, several of our consumers complained about a peculiar, petroleum-like taste and scent in the lake water; but being unable to find any traces of it either in the reservoir, or even in the houses of the complainants, I was induced to attribute the same to local causes.

The complaints, however, became more frequent, and on the 18th of February the water of almost all the hydrants in the city had a smell and taste of petroleum, and was slightly discolored, being clear but yellow.

On the following morning, the water in the Reservoir, on being examined, was found to have the same taste, scent and color, and, by extending the examination to the Aqueduct, the same quality of water was found there.

In the afternoon of the same day, a special meeting of the Board was held, in consultation with Professor J. L. Cassels, who, after a short examination of the water, stated that no apprehension of any immediate danger to health from the use of the lake water in its present state, need be had, as it contained neither oil nor acid, but was impregnated with the scent of petroleum.

The Professor stated further, that, in his opinion, a countercurrent of the water under the ice caused the discharge of the Cuyahoga river to flow westwards, and thus the river water was brought to the inlet, and from there taken into the city.

The Superintendent was ordered to make a careful investigation, and to report to the Board.

In compliance with this order, your Superintendent went, on the 19th of February, to the Inlet Tower, and by cutting holes into the ice, found the same impregnated water, on the shore near the Inlet Tower, one thousand feet north of the inlet, a mile west of it, and at that point at the same distance from the shore.

The examination was not extended further west; but it is my belief that this impure water extends several miles west.

At a distance of 1,050 feet north from the inlet pure water was found.

Extending the investigation east from the inlet, it was found that the closer we came to the river the narrower became the extent of the polluted water in a northerly direction, and upon entering the river it was discovered that the ice, which was driven about four weeks ago by a violent easterly gale towards our shore, got lodged on the shoals in front of the mouth of the river, commencing at the east pier, turning in a quarter circle of about 250 feet radius westward, and then in an almost straight line towards the inlet, several hundred feet in length.

This iceberg extended not only to the bottom of the lake, but also from fifteen to twenty feet above it, and from thirty to sixty feet in width, thus forming a solid ice-bank, which the river was unable to break, and consequently the polluted water of the Cuyahoga, finding its natural flow barricaded, was forced into the unobstructed westerly channel, formed by the ice so much the easier, as this was covered with a smooth sheet of ice, eighteen inches thick, which protected the water from the influence of winds.

At a distance of 500 feet north of the east pier, and immediately east of the same, pure water was found, demonstrating plainly that all the contaminated water of the river flowed westwards.

During these investigations the weather moderated considerably, so that it was not safe to examine farther northwards, to discover the distance of the return flow.

The day after these investigations were concluded, the ice on the river broke up; the next day the river rose three feet, and by noon broke through the ice-barricade, flowing in its natural course again, subsiding rapidly.

On the 25th of February the river had receded to its usual level, and the lake was discolored for a distance of about 2,000 feet northwards and east of the river, by the rapidly discharging contents of the river.

Immediately after this breaking up of the river, the water on the inlet became less tainted, and, after three days, the petroleum had disappeared entirely.

Several fire-hydrants, at the end of long lines of pipes, have been kept running since then to flush the pipes, and, as soon as the weather will permit, the Reservoir has to be cleaned, and the pipes will be flushed more, to get every vestige of impurity out of the same.

With the assistance of nature, this calamity was of short duration, but the attention of the Board should be directed to the prevention of its recurrence.

In the opinion of your Superintendent, there are only two ways to do this effectually:—

1. By the strictest enforcement of the existing city ordinances, against the pollution of any stream or water-course tributary to the Cuyahoga river, and compelling the slaughter houses, oil refineries, soap, glue, and other factories, which use these streams now as a sewer, to dispose of their waste in some other way; or

2. By expending about $500,000.00 for the construction of a tunnel under the lake, similar to that in progress of construction in Chicago.

The first plan is undoubtedly the cheapest for the city, and, from all that could be ascertained, can be accomplished without any detriment to the manufactories; and it is respectfully suggested that the Board may memoralize the City Council about this matter, and should the existing ordinances not fully meet the demand, to make them so.

If this can be accomplished, no further pollution of the present source of water supply for our city need to be apprehended, and the necessity of doubling the indebtedness of the city Water Works purposes may be obviated, until the growth of the city would justify such an expenditure.

Besides this, every coming winter, the precaution may be taken to watch the action of the ice at the mouth of the river, and, should a similar barrier be formed again, to open the natural channel of the river immediately, by blasting.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent.

With your usual promptness, you addressed the following report to the Mayor of the City:

Office of Water Works,
Cleveland, March 2, 1866.

SPECIAL REPORT OF THE BOARD OF TRUSTEES OF WATER WORKS IN RELATION TO THE PRESENT QUALITY OF WATER OF LAKE ERIE.

To the Honorable, the Mayor and Council of the City of Cleveland:

The undersigned Trustees of Water Works for the City of Cleveland, beg leave to report to your honorable body, that in the discharge of their duties as managers of the important interests committed to them, their attention was directed during the past month to the fact that the supply of water furnished to the citizens was polluted, and offensive to the taste and smell, and deleterious to the health and comfort of those citizens dependent upon the Water Works for supply. We should have been derelict to duty had we not promptly investigated the cause of so serious a disaster, with a view to apply an immediate remedy, and recover the well-deserved reputation of our Water Works for a supply of pure water to our citizens, so necessary to their health, cleanliness and comfort; and to this end we called to our aid Professor Cassels of our city, an eminent and scientific chemist, who, making a hasty examination, gave assurance that no immediate danger to the health of our citizens need be apprehended, thus relieving much anxiety. Our examination of the cause of the pollution of the water leads to the conclusion, that in consequence of unusual large bodies of ice, formed in the lake, being driven upon the shore and grounding upon the bars at the east and north of the harbor entrance, thus damming up the natural debouch of the water from the Cuyahoga river, which water had become very much polluted and impregnated with the refuse of the petroleum refineries, constructed within the past two years upon the canal, the river and its tributaries; and the action of heavy western and northwestern gales upon the open body of water in the lake, beyond the ice, a counter-current under the ice, near the shore, had been caused, by which this offensive and polluted water had been brought within the influence of the suction into the inlet-pipe of the Water Works, from thence forced into the reservoir, and from thence distributed through the city.

The trustees found themselves, in this state of the case, unable to do more than to change the water as rapidly as possible in the reservoir and pipes, and depend upon the action of the elements to remove the barrier to the flow of the offensive water in its natural course from the river, eastwardly from the city.

The trustees have further to say, that in the original design and location of the inlet-pipe, our predecessors were guided by a sound judgment, and had reasonable ground for the belief that it was not possible for the water in the lake, near the mouth of the inlet-pipe, to be polluted from the water of the Cuyahoga river; but, in the light of our recent experience, we must admit the possibility of a like occurrence in the future, and with a rapidly accumulating population, and the extraordinary amount of offensive matter incident to new branches of business and manufacture in our city and its vicinity, and which is in a great measure deposited in the river (the great natural sewer of the city), we are of opinion, there is an imperative demand upon our municipal authorities, consisting of our Executive, the Council, and Trustees of Water Works, for increased vigilance in the prevention of pollution to the water used by our citizens, and to that end (believing the present ordinance to be defective), we recommend the passage by the Council of the amendatory ordinance accompanying.

We enclose herewith, also, the Report of the Superintendent and Engineer upon the same subject.

All of which is respectfully submitted.

W. B. CASTLE,
WM. BINGHAM,
PETER THATCHER,
Trustees of Water Works.

At the same time, you concluded to engage Prof. J. L. Cassels to further investigate the subject, and to analyze the now tainted, as well as pure water, of Lake Erie; and in due time his report was laid before you.

In the latter part of December, 1866, the same petroleum scent and taste, accompanied by the peculiar yellowish tint of the water, appeared again, but in a slight degree only.

This time it was caused by the sudden breaking up of the ice on the 25th day of December. A very strong northeasterly gale prevailing at that time, and lasting over a week, drove the ice, with the immense quantities of impurities (thrown into the river chiefly from oil refineries), westwards, contaminating the water for nearly a mile in that direction. As soon as the gale subsided, the water became again pure and tasteless.

This is a very serious matter, and your utmost endeavor should be directed to the permanent prevention of any pollution of the source of supply, from which this necessary element is now drawn for the supply of our citizens.

The piers at the mouth of the river will be extended by the United States Government, some 500 feet further north from their present terminus, as early as this coming spring, and, it is presumed, that by thus bringing the piers into deep water, the possibility of any flow of the river water westwards will be effectually prevented.

Should this pier-extension not produce the anticipated result, the strict enforcement of the city ordinance, forbidding the pollution of the river, would undoubtedly be beneficial, and a large expenditure of money, for either extending the inlet further into the lake, or for tunnelling under the same, could be obviated.

II. ENGINE HOUSE AND LOT.

The repairs and improvements, proposed last year, for this part of the works, have been necessarily delayed, on account of so much other work that had to be done on the distributing pipes in streets, which the city improved permanently, by paving, and the extensive repairs of the engines.

The ensuing season, the following work ought to be done:—

1. Painting of engine house roofs.
2. Painting of inside woodwork and walls.
3. Repairing ceilings and stairs.
4. Additional stays for iron chimney.
5. Placing of iron sills on front doors.
6. Railings between beam columns and wall, to prevent visitors from coming in too close proximity to the working parts of the engines.
7. Entire new pointing of the outside of brick walls with cement, as the old mortar is crumbling off.

The coal dock needs a new floor, and new capacious bins should be erected in place of the old ones, which are nearly decayed, and altogether too small for the increased working of the engines. These new coal bins should be roofed to protect the fuel against the weather.

III. PUMPING ENGINES AND BOILERS.

The Engineer in charge of the engines has not made any report this year.* From my own observation, I can state, that in June the cylinder cover of west engine was raised, for the purpose of examining cylinder and piston, and the old piston packing was found so much corroded by the action of the steam, that it was deemed best to substitute an entire new packing.

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*The report here alluded to, was received on the 25th day of January, after this yearly report was finished, and contained substantially the same accounts as here enumerated.

After a consultation with Mr. J. W. Holloway, the constructing engineer of the Cuyahoga Steam Furnace Company, it was decided to make a different and more effectual packing than the former rings and springs. This new packing is the invention of Mr. Holloway, and has given great satisfaction wherever it is used.

The new packing was placed on the piston in September, the hollow spaces of the piston filled with cedar wood, the engine thoroughly overhauled, repaired, and on the 24th of September run again for the first time, after a stoppage of three months.

Since that time the engine has performed very well again.

After the west engine had been satisfactorily tried, the cylinder of the east engine was likewise examined, and the piston and packing found in the same corroded condition. It was repaired in the same way as the west engine, and is now, likewise, in very good order.

The main pump valve of west engine received a new rubber belt, and a new improved injection valve was put in. The keyway of air-pump rod fractured, and the rod was properly repaired.

The new valve chamber for west engine, ordered at the Allaire Works last winter, arrived here in July last, but as the repairing of the piston was going on at that time, and as the wrought grips, put temporarily on the broken chamber last fall, have given entire satisfaction thus far, it was deemed expedient to delay the placing of the new chamber until next spring.

During the past year 587,372,220 gallons of water were pumped, showing an increase of 70,111,215 gallons over the previous year.

The engines worked during the past year 314 days; the average running time per day being 10 hours 35 minutes, which is an increase of 1 hour 2 minutes per day over 1865.

Number of strokes of east engine............	902,175
Number of strokes of west engine............	927,645
Total number of strokes	1,829,820

Average height above surface of Lake Erie to which the water was raised, 1,577,315 feet.

Duty of east engine	35,625,991
Duty of west engine	34,763,110

pounds of water raised one foot high, with every 100 lbs. of coal consumed for raising steam and pumping.

This duty is calculated by the Cornish method, and no deduction made for cinders and ashes.

The accompanying schedule A exhibits the engine record for 1866, and schedule B a tabular statement of their aggregate performances since the commencement of the operations of the works.

Schedule C shows the monthly and the average daily consumption of water in the past year, and the totals and averages of all previous years.

In this schedule, the annual increase in the consumption, since the introduction of the lake water, will also be seen, showing for 1866 an increase of 13.55 per cent over 1865.

IV. RESERVOIR.

The reservoir was cleaned, repaired and trimmed, and serves its purpose in every respect, except capacity. When full it contains six million gallons of water, which will last, at the present rate of consumption (one and one-half millions of gallons per day), for four days only.

That this capacity is entirely inadequate to the rapid increase of our population, and the demand for water facilities for manufacturers, is too evident to need further proofs.

For this reason, your particular attention is called to the necessity of providing, at an early date, for additional facilities for storing water.

It is respectfully suggested to build an additional reservoir in rear of the present one, on the same principle and of similar material as the former; and as the building of such a reservoir has to be done very gradually, to give the new embankments time to settle and solidify, it would take three years to complete it.

The greatest care would be required to unite the old and the new embankments, but by working gradually, it could be accomplished without any risk of future ruptures and leakage.

Such a reservoir would have a capacity of 7,000,000 gallons, and would require 140,000 cubic yards of earth to build it. The estimated cost of this additional reservoir would be about $166,000.00.

Should this proposition meet your favor and approval, it would become necessary to ask the City Council for an additional loan of at least $200,000.00 to be procured in conformity with the laws and charter of the city.

The wooden stairs leading to the top of the reservoir are now so much decayed that it is really dangerous for visitors to pass up or down, and it is most earnestly recommmended to authorize the substitution of stone or iron stairs.

The complaints about people running on the turf are rather increasing, and the damaged condition of the outside slopes of the reservoir embankments compels me to ask you again for employing a suitable man, whose duty would keep him constantly upon the grounds; and his wages would be fairly earned by keeping the place in proper order.

V. DISTRIBUTION.

The new main was completed last year, and is now in successful operation.

The river part of it was sunk on the 12th day of October, and the connections on both sides were made immediately after.

The whole pipe system is in good order, and only a few small leaks have occurred during the year.

A large amount of pipes, laid in former years, had to be lowered, on account of the streets being graded down to newly established grades.

The widening of the sidewalks in streets recently paved, requires the removal of the fire hydrants to the curbstone, as the steamers experience sometimes great difficulty in attaching their suction pipes to the hydrants in their present situation.

During the past year, 126,215 feet, or 239 miles, of new pipe were laid, making the total length of all pipes now in use, 3,438 miles.

The location, size and length of the pipes laid in 1866, are specified in the amended schedule D, which gives, also, a general survey of the whole pipe system in the city.

Schedule E exhibits the number and size of stop-gates, set during the year in connection with the pipe extension, and also a table showing the whole number of stop-gates now in use, and their different sizes.

Schedule F gives the additional fire hydrants connected and set in 1866.

New connections with the distributing pipes were made during the past year, as follows:

1 inch connections	9
¾ inch connections	9
⅝ inch connections	231
Total	249

The entire number of service pipe connections on the last day of December, 1866, was 1,853, which are classified as follows:

4 inch connections	4
3 inch connections	3
2 inch connections	21
1½ inch connections	10
1 inch connections	67
¾ inch connections	145
⅝ inch connections	1,603
Making in all, as above	1,853

The increase of water rent, however, is not in proportion with the number of new connections made; a large number of these connections were made to the stop-cock on the sidewalk, only on streets ordered to be paved, and where the property owners were obliged to make the service pipe connections to the curbstone before the paving was done.

The pipe extension in 1867 must be very limited, as no available funds are at present in the treasury, and none of any account can be received until the water rents, falling due in June, are paid.

VI. GENERAL REMARKS.

Last year's expenditures have been, according to the certified vouchers, as follows:

I. RUNNING EXPENSES.

Pay Rolls for 12 months	$ 9,681 47	Cement	$ 12 00
Coal	3,042 79	Advertising, Printing and Stationery	227 95
Analysis of Water	500 00	Rent of Store Room	125 00
Oil, Tallow and Soap	369 74	Ice for Office	10 88
Cotton Waste and Hemp Packing	184 09	Small Stores	59 41
Hardware	27 10		
Plumbing Work	70 73		$14,680 97
Brass Work	344 77	Received for sundries	502 34
Iron Work	25 04		

Net expenditures—Running Expenses $14,178 63

II. REPAIRS.

Pay Rolls for 12 months	$ 3,427 93	Freight and cartage	$ 252 70
Coal	63 75	Firebricks and clay	12 50
Rep'rs of mach'ry & tools	4,432 62	Paving	24 75
Brass work	25 50	Trees	29 00
Carpenter work and lumber	348 64	Small stores	33 10
Stone cutter	170 99		
Hire of steam pump	1,145 70		$10,362 89
Hardware, hose and rope	349 87	Received for sundries	1,505 43
Plumbing	17 28		
Painting	28 56	Net expenditures—repairs	$ 8,857 46

III. PIPE EXTENSION.

Pay rolls for 12 months	$ 5,267 12	Advertising	$ 18 00
Cast iron pipes	18,074 89	Carpenter work and lumber	423 41
Iron and cement pipes	2,442 81	Iron work	292 08
Wrought river pipe	4,397 23	Brass work	69 50
Dredging and launching	2,454 80	Meters	25 00
Stop-gates	600 00	Hardware	142 73
Pig lead	1,325 91	Sundries	32 25
Plumbing	45 34		
Coal and wood	62 75		$ 35,781 17
Wood plugs	11 85	Received for sundries	1,047 83
Packing yarn	49 87		
Paving	63 63	Net expenditures, pipe extension	$ 34,733 34

IV. CONSTRUCTION FUND.

Steam gauges	$ 78 58	Carpenter work	$ 4 50
Lamps and brackets	28 30		

Net expense—Construction Fund .... $ 111 38

The entire cost of the Water Works to December 31st, 1866, amounts to $654,224.40—to wit:

1. Cost of construction to December 31, 1858	$518.731 88
2. Cost of construction and pipe extension in 1859	25,098 05
3. Cost of construction and pipe extension in 1860	4,108 72
4. Cost of construction and pipe extension in 1861	3,727 87
5. Cost of construction and pipe extension in 1862	3.647 02
6. Cost of construction and pipe extension in 1863	7,964 34
7. Cost of construction and pipe extension in 1864	27,011 21
8. Cost of construction and pipe extension in 1865	29,090 59
9. Cost of construction and pipe extension in 1866	34,844 72
Total, as above	$654,224 40

The last general assessment of all premises where the Lake water is used, was made in 1862, and since that time nearly 1,300 additions and alterations on these premises have been reported by the licensed plumbers. A new general assessment should be made again, early this coming spring, to have the same finished and the books completed before the June leases become due. The tariff of rates should be revised, and the rules and regulations for the government of the Water Works amended, in conformity with the experience of the last five years.

Propositions for this purpose will be submitted to your consideration at an early day.

In reference to the report of Prof. J. L. Cassels, where the same relates to service-pipes, I must take the liberty to remark, that notwithstanding I fully concur in his opinion about lead pipe, I cannot recommend iron pipe on account of its short duration; but would suggest the adoption of the patent lead encased, block-tin pipe, whereby all the objections to lead, zinc, and iron service-pipes are obviated. I consider this pipe to meet the requirements of service water pipes better than any other pipe that has come under my observation.

This pipe is manufactured in New York, and as it is furnished at the same price as corresponding sizes of lead pipe of equal strength, it should be extensively used.

The existence of such pipe need but be known to be adopted by all consumers of Lake water, in preference of all other pipes.

For these reasons it is recommended to license the use of this pipe for service water pipes, under the same condition as lead pipe is permitted, provided the pipe continues to be made like the samples in this office.

All of which is respectfully submitted.

JOSEPH SINGER,
Superintendent and Engineer.

SCHEDULE A.

ENGINE RECORDS FOR 1866.

EAST ENGINE.

Months.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped.	Hight		Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet.	Dec'mls.	
January	106	55	58,875	8,200	62,200	70,400	18,898,875	158.638		35,614,303
February	126	40	68,550	12,000	73,400	85,400	22,004,550	158.868		34,233,002
March	117	40	62,050	11,400	65,600	77,000	19,918,050	158.173		34,217,035
April	121	10	59,375	13,400	59,800	73,200	19,059,375	157.595		34,315,786
May	52	25	24,325	3,000	22,200	25,200	7,808,325	157.666		40,855,387
June	267	40	144,150	20,500	151,500	172,000	46,272,150	156.809		35,277,991
July	309	05	179,125	21,200	181,200	202,400	57,499,125	156.765		37,243,783
August	310	15	173,975	21,000	184,600	205,600	55,845,975	156,962		35,654,736
September	238	15	131,750	17,600	142,800	160,400	42,291,750	157.227		34,668,284
Total averages....	1650	05	902,175	128,300	943,300	1,071,600	289,598,175	157.634		35,625,991

WEST ENGINE.

January	157	55	85,045	22,200	101,000	123,200	27,299,445	158.827	29,432,110
February	118	55	64,825	12,200	75,400	87,600	20,808,825	158.763	31,538,911
March	151	20	81,625	13,200	90,400	103,600	26,201,625	158.422	33,507,182
April	118	45	63,475	9,200	68,200	77,400	20,375,475	157.840	34,748,641
May	232	30	124,650	20,200	135,200	155,400	40,012,650	158.186	34,061,856
June	13	25	6,875	1,800	6,800	8,600	2,206,875	157.166	33,728.096
September	49	30	24,125	6,700	23,300	30,000	7,744,125	157.149	33,924,750
October	293	40	166,125	20,600	166,600	187,200	53,326,125	157.126	37,432,214
November	269	45	155,300	20,800	153,800	174,600	49,851,300	157.429	37,589,879
December	265	45	155,600	21,600	161,400	183,000	49,947,600	157.384	35,923,452
Total averages....	1671	30	927,645	148,500	982,100	1,130,600	297,774,045	157,829	34,763,110

SCHEDULE B.

AGGREGATE ENGINE RECORDS FOR ALL YEARS FROM THE COMMENCEMENT.

EAST ENGINE.

Years.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped	Hight	Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet. Decml's.	
1857	693	35	231,354	118,850	235,225	354,075	73,626,095	158,000	29,604,192
1858	524	15	197,486	107,850	190,725	298,575	62,847,939	156.533	31,202,484
1859	668	15	300,064	111,750	262,050	373,800	95,420,352	155,896	35,329,535
1860	999	20	453,318	142,600	377,050	519,650	144,154,124	156.499	36,276,689
1861	1,066	45	509,785	131,550	415,900	547,450	162,111,630	156.424	38,690,736
1862	1,224	15	603,407	142,206	572,693	714,899	191,883,426	156.410	35,102,083
1863	1,187	35	605,475	132,788	559,500	692,288	194,357,475	156.693	36,788,845
1864	1,269	50	601,800	126,456	643,068	769,524	218,857,800	157,348	37,424,474
1865	1,507	00	835,525	147,600	799,400	947,000	268,203,525	158.084	37,441,769
1866	1,650	05	902,175	128,300	943,300	1,071,600	289,598,175	157.634	35,625,991

WEST ENGINE.

1857	512	50	168,540	107,350	172,100	279,450	53,636,170	158,000	28,321,942
1858	630	40	249,238	124,200	239,500	363,700	79,307,495	156.533	31,704,166
1859	744	45	323,691	121,300	287,550	408,850	102,813,738	155.958	36,065,129
1860	811	45	364,985	116,150	330,900	447,050	116,066,230	156.434	34,137,118
1861	1,040	50	503,344	133,050	438,250	571,300	160,063,392	156.440	36,405,441
1862	1,122	50	559,087	134,640	542,434	677,074	177,789,666	156.304	34,317,546
1863	1,402	55	705,400	149,115	709,918	859,033	226,433,400	156.694	34,541,163
1864	1,578	20	801,425	148,288	802,500	950,788	257,256,425	157.278	35,588,054
1865	1,464	40	775,880	139,850	780,150	919,500	249,057,480	157.950	35,778,436
1866	1,671	30	927,645	148,500	982,100	1,130,600	297,774,045	157.829	34,763,110

TOTAL AND AVERAGES OF BOTH ENGINES TOGETHER FOR EACH YEAR.

1857	1,206	25	399,894	226,200	407,325	633,525	127,262,265	158.000	29,003,067
1858	1,154	55	446,724	232,050	430,225	662,275	142,155,434	156.533	31,453,325
1859	1,413	00	623.755	233,050	549,600	782,650	198,234,090	155.927	35,697,332
1860	1,811	05	818,303	298,750	707,950	966,700	260,220,354	156.466	35,206,903
1861	2,107	35	1,013,129	265,600	854,150	1,118,750	322,175,022	156.432	37,548,089
1862	2,347	05	1,162,494	276,846	1,115,127	1,391.973	369,673,092	157.357	34,720,024
1863	2,590	30	1,310,875	281,903	1,169,418	1,551,321	420,790,875	156.693	35,535,438
1864	2,848	10	1,483,225	274,744	1,445,568	1,720,312	476,114,225	157.313	36,410,146
1865	2,971	40	1,611,405	286,950	1,579,550	1,866,500	517,261,005	158.017	36,621,770
1866	3,321	35	1,829,820	276,800	1,925,400	2,202,200	587,372,220	157.731	35,304,587

SCHEDULE C.

Showing the Distribution of Water in Each Month in 1866.

Month.	Gallons Distributed.			
	Per month.	Average per day.	Ea. Inh. per day.	Ea.Co's'r per day.
January	46,198,320	1,490,268	20.70	115.09
February	42,813,375	1,529,049	21.23	118.07
March	46,119,675	1,487,731	20.67	114.88
April	39,434,850	1,314,495	18.27	101.50
May	47,820,975	1,542,612	21.42	119.12
June	48,479,025	1,615,967	22.44	124.78
July	57,499,125	1,854,810	25.76	143.20
August	55,845,975	1,801,483	25.12	139.88
September	50,025,875	1,667,862	23.16	128.79
October	53,326,125	1,720,197	23.89	132.83
November	49,851,300	1,661,710	23.08	128.31
December	49,947,600	1,611,213	22.38	124.42
Total and average	587,372,220	1,609,239	22.35	124.26

Totals and Averages for All Years Since Completion of Works.

Years.	Gallons Distributed.				Per Cent. of Increase.
	Per year.	Average per day.	Ea. Inh. per day.	Ea.Co's'r per day.	
1857	127,262,265	348,664	7.75	110.68	....
1858	142,155,434	389,467	8.37	93.44	11.70
1859	198,234,090	513,107	11.31	91.27	39.45
1860	260,220,354	710,984	14.11	101.57	31.27
1861	322,175,022	881,599	16.32	114.50	23.81
1862	368,673,092	1,012,794	19.47	120.57	14.74
1863	420,790,875	1,152,851	20.97	117.54	13.83
1864	476,114,225	1,300,858	21.68	123.89	13.14
1865	517,261,005	1,417,153	21.80	122.70	8.64
1866	587,372,220	1,609,239	22.35	124.26	13.55

SCHEDULE D.

I. Showing the Extension of Water Pipes in the Year 1866.

Diam. of Pipes in Inch.	In What Street.	Between What Streets.	Feet Laid.	Total Feet.	Remarks.
20	Ohio	Across Cuyahoga river	235.00	....	
				235.0	Wrought iron.
16	Ohio	Pittsburgh, across canal	1,186.60	....	Cast iron.
16	Ohio	Stone's levee and river pipe	139:00	....	Cast iron.
16	Girard	River pipe and Scranton avenue..	121.5	....	Cast iron.
16	Girard	Scranton avenue and Worthington.	400.00	....	Cast iron.
16	Worthington .	Girard and Tracy	1,096.5	....	Cast iron.
16	Franklin . . .	Tracy and Columbus	400.00	....	Cast iron.
				3,343.0	
6	Ohio	Connection between 16-in. main and distributing pipe in Canal street..	17.25	....	Cast iron.
6	Scranton . . .	Con. bet. 16-in. main and distrib'g pipe, at intersec. with Girard st.	2.75	191.5	Cast iron.
6	Girard	Scranton avenue and Worthington.	11.00	....	Cast iron.
6	Detroit	Center and Terrace	145.00	....	Cast iron.
6	Worthington .	Con. bet. 16-in. main and distrib'g pipe, at intersection with Girard..	7.75		
6	Worthington .	Con. bet. 16-in. main and distrib'g pipe at curve s. of Mahon'g R. R.	7.75	....	Cast iron.
				191.5	
4	Frankfort . .	Crossing Water street to distributing pipe in same	44.00	....	Cast iron.
4	Frankfort . .	Bank and Water	481.00	....	Iron & cement.
4	Frankfort . .	Crossing of Bank	71.00	....	Cast iron.
4	Chestnut . . .	Erie and Oak	358.00	....	Iron & cement.
4	Pittsburgh . .	Irving and Jackson	297.00	....	Iron & cement.
4	West River .	Spruce and Old River Bed	51.00	....	Cast iron.
4	West River .	Detroit and Columbus	158.00	....	Iron & cement.
4	Brownell . . .	Crossing of Prospect to north line..	57.00	....	Cast iron.
4	Bolivar	Crossing of Prospect to south line..	4.5	....	Cast iron.
4	Bolivar	Prospect and Erie	988.00	....	Iron & cement.
4	Huntington ..	Crossing of Prospect to north line..	47.00	....	Cast iron.
4	West	Vineyard and Merwin	177.00	....	Cast iron.
4	Dodge	Crossing of Euclid to north line....	41.5	....	Cast iron.
4	Dodge	Euclid and Superior	1,056.00	....	Cast iron.
4	Dodge	Euclid and Superior	367.00	....	Iron & cement.
4	Kinsman . . .	Willson ave & Woodland cemetery	2,550.00	....	Iron & cement.
4	Canal	Vineyard and Seneca	302.00	....	Cast iron.
4	Canal	Crossing of Seneca	78.00	....	Iron & cement.
4	Canal	Eagle and Ohio	1,031.00	....	Cast iron.
4	Michigan . . .	Canal and Seneca	243.00	....	Cast iron.
4	Seneca	Canal and Michigan	113.00	....	Iron & cement.
4	Wood	Superior and Rockwell	76.00	....	Cast iron.
4	Miami	Crossing of Bolivar to south line ..	37.00	....	Cast iron.
4	Miami	Bolivar and Eagle	70.00	....	Iron & cement.
4	Miami	Eagle and Ohio	63.00	....	Iron & cement.
				8,761.0	
3	Bolivar	Fire hydt. con. bet. Prospect & Erie	16.00	....	Cast iron.
3	Dodge	Fire hydt. con. opposite Walnut....	23.00	....	Cast iron.
3	Dodge	Fire hydt. con. bet. Euclid and Chestnut	16.00	....	Cast iron.
3	Michigan . . .	Fire hydt. con. near junc. of Canal.	37.00	....	Cast iron.
				92.0	
				12,621.5	Ft., or 2.39 mi.

SCHEDULE D—Continued.

II.—EXHIBITING ALL THE PIPES LAID TO DECEMBER 31, 1866.

Diameter in inches ..	24	20	16	10	8	6	4	3	2
Previous to 1866.......	2,668	10,678	9,111	9,541	14,457.5	23,015.25	93,096.25	5,543	794
Laid in 1866	......	235	3,343	......	....	191.50	8,761.00	92	......
Total	2,668	10,913	12,454	9,541	14,457.5	23,206.75	101,857.25	5,635	794
		26,035				155,491.5			

26,035.0 feet, or 4.931 miles of supply main, and
155,491.5 feet, or 29,449 miles of distributing pipes.

181,526.5 feet, or 34.380 miles in all.

SCHEDULE E.

I.—Showing the Size, Number and Location of Stop Gates Set in 1866.

Number.	Waterway in Inches.	LOCATION.	
		Street.	Side of Street.
1	16	Worthington	Between Girard and Mahoning R. R.
1	16	inch gate.	
1	6	Ohio	On conn. bet. 16-in. main and dist'n pipe for Canal street.
1	6	Worthington	On conn. bet. 16-in. main and dist'n pipe for Girard street.
1	6	Worthington	On conn. between 16-in. main south of M. R. R.
1	6	Detroit	South line of, corner of West River.
4	6	inch gates.	
1	4	Frankfort	East line of Water.
1	4	Frankfort	West line of Bank.
1	4	Frankfort	East line of Bank.
1	4	Pittsburgh	West line of Jackson.
1	4	Brownell	North line of Prospect.
1	4	Bolivar	South line of Prospect.
1	4	Bolivar	East line of Erie.
1	4	Huntington	North line of Prospect.
1	4	Dodge	North line of Euclid.
1	4	Dodge	North line of Chestnut.
1	4	Canal	South line of Michigan.
1	4	Canal	West line of Seneca.
1	4	Canal	South line of Eagle.
1	4	Canal	South line of Ohio.
1	4	Michigan	East line of Canal.
1	4	Wood	North line of Superior.
1	4	Miami	South line of Bolivar.
1	4	West River	South line of, corner of Detroit.
18	4	inch gates.	

RECAPITULATION.

1 16-inch stop-gate.
4 6-inch stop-gates.
18 4-inch stop-gates.

—

23 stop-gates in all.

SCHEDULE E—Continued.

II.—TABLE EXHIBITING THE WHOLE NUMBER OF STOP-GATES IN USE DECEMBER 31, 1866.

Water way in inches......	24	20	16	10	8	6	4	3	2	Total.
Former years	2	13	13	11	29	47	232	34	3	384
In 1866	.....	.....	1	.....	.....	4	18	.....	.....	23
Total	2	13	14	11	29	51	250	34	3	407

SCHEDULE F.

Giving Number and Location of Fire Hydrants added in 1866.

No.	STREET.	BETWEEN.	SIDE OF ST.
1	Bolivar	Prospect and Erie	South.
1	Dodge	Euclid and Chestnut	West.
1	Dodge	Opposite Walnut	East.
1	Michigan . . .	Near its junction with Canal street	North.

4	Fire hydrants in 1866.
179	Fire hydrants in former years.
183	Fire hydrants in the City for the use of the Fire Department, and all in good order.

SCHEDULE G.

Showing the Relative Elevations, in Feet and Decimals, of the Intersections of Streets above the Established Base, and Levels Below Top Water-Line of Reservoir.

Intersection of Streets.	Above Base.	B'l'w top Water Line.	Intersection of Streets.	Above Base.	B'l'w top Water Line.
Pearl and Spruce	63.00	92.00	**Merwin and Columbus**	20.20	134.80
Pearl and Washington	86.20	68.80	**Merwin and British**	6.97	148.03
Pearl and Vermont	93.30	61.70	**Merwin and German**	5.44	149.56
Pearl and Detroit	95.00	60.00	**Merwin and Center**	3.90	151.10
Pearl and Church	101.59	53.41	**Merwin and West**	6.65	148.35
Pearl and Franklin	110.80	44.20	**Merwin and James**	15.60	139.40
Pearl and Vestry	109.75	45.25	**Merwin and Superior**	18.07	136.93
Pearl and Jay	109.48	45.52	Center and Vineyard	13.40	141.60
Pearl and Bridge	109.10.	45.90	Center and Columbus	6.97	148.03
Pearl and Carroll	108.85	46.15	Center and Merwin	3.90	151.10
Pearl and Lorain	108.45	46.55	River and Front	2.00	153.00
Pearl and Freeman	107.25	47.75	River and Lighthouse	3.75	151.25
Pearl and Chatham	106.30	48.70	River and St. Clair	17.12	137.88
Pearl and Willey	105.36	49.64	River and Superior	18.28	136.72
Pearl and Monroe	98.96	56.04	Meadow and Front	2.70	152.30
Spruce and Elm	3.82	151.18	Meadow and Lighthouse	9.95	145.05
Spruce and Center	9.22	148.78	Spring and Front	12.40	142.60
Spruce and Mulberry	26.43	128.57	Spring and Lighthouse	19.00	136.00
State and Detroit	99.80	55.20	Spring and St. Clair	26.08	128.92
State and Church	101.29	53.71	Water and Lighthouse	60.00	98.00
State and Franklin	120.91	34.09	Water and Lake	70.50	84.50
West River and Spruce	3.00	152.00	Water and Mandrake	71.80	83.20
West River and Main	1.08	153.92	Water and St. Clair	72.60	82.40
West River and Second	2.50	152.50	Water and Frankfort	75.00	80.00
West River and First	4.00	151.00	Water and Superior	72.21	82.79
W. River, opp. Superior.	5.00	150.00	Vineyard and Superior	71.50	83.50
West River and Elm	7.00	148.00	Vineyard and Long	58.00	97.00
West River and Center	14.00	141.00	Vineyard and James	26.60	128.40
West River and Detroit	35.70	119.30	Vineyard and Center	13.40	141.60
Elm and Second	6.83	148.17	Bank, north of Lake	59.00	96.00
Elm and Main	5.67	149.33	Bank, north of Lake	67.80	87.20
Elm and Spruce	3.82	151.18	Bank and Johnson	71.40	83.60
Center and Detroit	14.00	141.00	Bank and St. Clair	75.00	80.00
Center and First	32.00	123.00	Bank and Frankfort	79.10	78.90
Center and Second	26.50	128.50	Bank and Superior	82.30	72.70
Center and Main	18.50	136.50	Seneca and Lake	71.20	83.80
Detroit and Center	14.00	141.00	Seneca and St. Clair	76.18	78.82
Detroit and West River	38.70	119.30	Seneca and Frankfort	78.68	76.32
Detroit and Pearl	95.00	60.00	Seneca and Superior	81.20	73.80
Detroit and Hanover	97.50	57.50	Seneca and Champlain	83.60	71.40
Clinton and State	100.40	54.60	Seneca and Michigan	69.70	85.30
Clinton and Duane	102.98	52.02	Seneca and Canal	37.00	118.00
Clinton and Kentucky	101.96	53.04	Ontario and Lake	73.00	82.00
Franklin and Columbus	36.80	118.40	Ontario and Hamilton	73.90	81.10
Franklin and Pearl	110.80	44.20	Ontario and St. Clair	74.80	80.20
Franklin and Circle	116.36	38.64	Ontario and Rockwell	78.00	77.00
Franklin and State	120.91	34.09	Ontario, Sup. av. of Park	89.06	68.94
Franklin and Duane	117.13	37.87	Ontario and Champlain	90.80	64.20
Franklin and Kentucky	110.95	44.05	Ontario and Michigan	93.20	61.80
Franklin and Harbor	109.85	48.15	Ontario and Pittsburgh	91.25	63.75

SCHEDULE G—Continued.

Intersection of Streets.	Above Base.	B'l'w top Water Line.	Intersection of Streets.	Above Base.	B'l'w top Water Line.
Vestry and York	109.80	45.20	Ontario and Howe	92.00	63.00
Carroll and York	107.30	47.70	Pittsburgh and Huron	91.42	63.58
Lorain and Tracy	110.00	48.00	Pittsburgh and Bolivar ..	92.12	62.88
Lorain and Columbus ...	102.90	52.10	Pittsburgh and Eagle	92.87	62.13
Lorain and Hicks	110.50	44.50	Pittsburgh and Ohio	84.33	60.67
Lorain and Abbey	109.80	45.20	Pittsburgh and Cross	101.37	53.63
Lorain and Pearl	108.45	46.55	Pittsburgh and Perry	109.14	45.86
Columbus and Franklin..	36.80	118.20	Pittsburgh and Liberty	103.57	51.43
Columbus and Lorain	102.90	52.10	Pittsburgh and Irving	101.47	53.53
Columbus and Abbey	104.15	50.85	Pittsburgh and Jackson ..	100.27	54.73
Columbus and Freeman..	105.40	49.60	Kinsman and Eagle	91.00	64.00
Columbus and Willey ..	100.00	55.00	Kinsman and Ohio	94.47	60.53
Columbus and Merwin ..	20.20	134.80	Kinsman and Cross	99.77	55.23
Columbus and Girard	6.78	118.22	Kinsman and Burnham ..	102.48	52.52
Columbus and Leonard ..	7.40	147.60	Kinsman and Vine	102.18	52.82
Columbus and Center	6.97	148.03	Kinsman and Harmon	101.73	53.27
Kinsman and Perry	102.04	52.96	Lake and Bond	71.50	83.50
Kinsman and Chapel	101.92	53.08	Lake and Erie	70.00	85.00
Kinsman and Irving	102.02	52.98	Lake and Alabama	53.94	101.06
Kinsman and Jackson ..	102.12	52.88	Lake and Williams	53.80	101.20
Kinsman and Belmont ..	102.82	52.12	Lake and Case avenue ..	52.50	102.50
Kinsman and Mayflower.	104.58	50.32	Hamilton and Ontario	79.90	81.10
Kinsman and Longworth	103.36	51.64	Hamilton and Wood	74.23	80.77
Kinsman and Forest	103.63	51.27	Hamilton anl Bond	72.52	82.48
Kinsman and Case ave..	103.87	51.13	Hamilton and Erie	71.64	83.36
Kinsman and Park	104.81	50.19	Hamilton and Muirson	64.52	90.48
Kinsman and Sawtell....	103.20	51.80	Hamilton and Brownell ..	64.45	90.55
Kinsman and Willson av.	102.10	52.90	Hamilton and Dodge	61.50	93.50
Wood and Lake	72.25	82.75	Hamilton and Alabama....	56.23	98.77
Wood and Hamilton	74.23	80.77	Hamilton and Sterling av.	56.78	98.22
Wood and St. Clair	74.95	80.05	Hamilton and Williams ...	54.60	100.40
Wood and Rockwell	76.57	78.42	Mandrake and Water	71.80	83.20
Wood and Superior	78.00	77.00	Mandrake at west end.....	76.50	78.50
Erie and Lake	70.00	85.00	St. Clair and River	17.12	137.88
Erie and Hamilton	71.62	83.36	St. Clair and Water	72.60	82.40
Erie and St. Clair	72.83	82.17	St. Clair and Bank	75.00	80.00
Erie and Oregon	74.59	80.41	St. Clair and Seneca	76.18	78.82
Erie and Superior	75.50	79.50	St. Clair and Ontario	74.80	80.20
Erie and Walnut	77.27	77.73	St. Clair and Wood	74.95	80.05
Erie and Chestnut	82.14	72.86	St. Clair and Bond	74.31	80.69
Erie and Euclid	86.30	68.70	St. Clair and Erie	72.83	82.17
Erie and Prospect	93.50	61.50	St. Clair and Muirson	66.30	88.70
Erie and Bolivar	95.36	59.64	St. Clair and Brownell	65.00	90.00
Erie and Eagle	95.20	59.80	St. Clair and Dodge	63.00	92.00
Erie and Kinsman	99.21	55.09	St. Clair and Perry	60.80	94.20
Brownell and Willson ..	59.35	98.05	St. Clair and Minnesota ..	57.50	97.50
Brownell and Lake	61.75	93.29	St. Clair and Alabama	55.50	98.50
Brownell and Hamilton ..	44.45	90.55	St. Clair and Delaware	58.00	97.00
Brownell and St. Clair ..	65.00	90.00	St. Clair and Sterling av...	56.70	98.30
Brownell and Euclid	87.00	68.00	St. Clair and Waring	55.70	99.30
Brownell and Prospect ..	94.00	61.00	St. Clair and Rossiter	53.20	99.80
Brownell and Ohio	97.24	57.76	St. Clair and Lawrence ..	53.90	99.10
Dodge and Lake	60.00	95.00	St. Clair and Phelps	55.70	99.30
Dodge and Hamilton	61.50	93.50	St. Clair and Merchant	53.30	99.70
Dodge and St. Clair	63.00	92.00	St. Clair and Williams	55.00	100.00

SCHEDULE G—Continued.

Intersection of Streets.	Above Base.	B'l'w top Water Line.	Intersection of Streets.	Above Base.	B'l'w top Water Line.
Dodge and Superior	70.00	85.00	Rockwell and Ontario	76.61	78.39
Dodge and Walnut	77.30	77.70	Rockwell and Wood	76.57	78.43
Dodge and Chestnut	82.50	72.50	Rockwell and Bond	74.88	80.12
Dodge and Euclid	86.50	68.50	Rockwell and Erie	74.90	80.10
Huntington and Euclid..	86.00	69.00	Superior and River	15.28	136.72
Huntington and Prospect	94.00	61.00	Superior and Union	63.74	85.26
Huntington and Garden.	93.93	61.07	Superior and Water	72.21	82.79
Cheshire and Prospect...	94.00	61.00	Superior and Bank	89.30	72.70
Cheshire and Garden	93.43	61.57	Superior and Seneca	81.20	73.80
Granger and Prospect ..	94.30	60.71	Superior, West av. of Park	82.20	72.80
Granger and Garden ...	93.65	61.35	Superior, east av. of Park	79.90	75.10
Perry and St. Clair	60.80	94.20	Superior and Wood	78.00	77.00
Perry and Euclid	89.00	66.00	Superior and Bond	76.60	79.00
Perry and Prospect	93.60	62.00	Superior and Erie	65.50	79.50
Perry and Cedar	95.73	59.27	Champlain and Vineyard ..	25.70	129.30
Perry and Garden	94.50	60.50	Champlain and Canal	26.00	129.00
Perry and Scovill	100.66	54.34	Champlain and Seneca	83.60	71.40
Perry and Kinsman	102.04	52.96	Champlain and Ontario	90.80	64.20
Perry and Pittsburgh	109.14	45.86	Michigan and Canal	38.00	117.00
Alabama and Lake	53.94	101.06	Michigan and Seneca	59.70	85.30
Alabama and Hamilton ..	56.23	98.77	Michigan and Ontario	93.20	61.80
Alabama and St. Clair ..	56.50	98.50	High and Ontario	92.00	63.00
Sterling ave. and Lake..	53.93	101.07	High and Middle	95.00	60.00
Sterling av. & Hamilton	56.78	98.22	Euclid & east av. of Park	88.81	66.19
Sterling av. and St. Clair	56.70	98.30	Euclid and Sheriff	87.83	67.17
Williams and Lake	53.80	101.20	Euclid and Erie	86.30	68.70
Williams and Hamilton..	54.60	100.40	Euclid and Muirson	88.30	66.70
Williams and St. Clair....	53.00	100.00	Euclid and Brownell	87.00	68.00
Lake and Water	70.50	84.50	Euclid and Dodge	86.50	68.50
Lake and Bank	67.80	87.20	Euclid and Huntington	86.00	69.00
Lake and Seneca	71.20	83.80	Euclid and Perry	89.00	66.00
Lake and Ontario	73.00	82.00	Euclid and Hudson	87.00	68.00
Lake and Wood	72.25	82.75	Euclid and Case av.........	88.50	66.50
Euclid and Park	92.00	63.00	Huron and Erie	94.10	60.90
Prospect and Ontario	93.60	61.40	Huron and Euclid	87.05	67.95
Prospect and Sheriff	94.20	60.80	Eagle and Kinsman	91.00	64.00
Prospect and Oak place.	94.90	60.10	Eagle and Erie	95.20	59.80
Prospect and Erie	93.50	61.50	Bolivar and Pittsburgh	92.12	62.88
Prospect and Brownell ..	94.00	61.00	Bolivar and Miami	94.58	60.42
Prospect and Huntington	94.00	61.00	Bolivar and Erie	95.36	59.64
Prospect and Cheshire ..	94.00	61.00	Bolivar and Prospect	95.18	59.82
Prospect and Granger ..	94.30	60.70	Ohio and Canal	28.58	126.42
Prospect and Perry	93.00	62.00	Ohio and Miami	92.57	62.43
Prospect and Hudson	95.00	60.00	Ohio and Pittsburgh	94.33	60.67
Prospect and Case av. ..	96.50	58.50	Ohio and Kinsman	94.47	60.53
Huron and Pittsburgh...	91.42	63.58	Cross and Pittsburgh	101.37	53.63
Huron and Miami	**95.93**	**59.07**	**Cross and Orange ....**	**101.90**	**53.10**

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ASTOR, LENOX AND TILDEN FOUNDATIONS

ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1867.

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REPORT

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CITY OF CLEVELAND

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ASTOR, LENOX AND
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REPORT

OF

Trustees of Water Works.

Office of Water Works, Cleveland, January 1, 1868.

To the Honorable, the Mayor and City Council of the City of Cleveland:

The Trustees of the Water Works herewith submit the Twelfth Annual Report of the Superintendent and Secretary of the Water Works, showing the operations of the department for the past year, and their present condition. Both reports are full, and we commend them to your consideration.

On the subject of pure water, we hope soon to lay before you a special report, with plans and estimates, for obtaining a supply of water that will be free from petroleum or other unpleasant substances, and to request your action in furtherance of this most desirable object.

Respectfully,
WM. BINGHAM,
E. M. PECK,
JNO. F. WARNER,
Board of Trustees of Water Works.

REPORT

OF THE

Secretary of Water Works.

Water Works Office, Cleveland, January, 1868.

To the Trustees of the Water Works:

Gentlemen: The following is a condensed statement of the cash account of the receipts and expenditures of the Water Works for the year 1867:

RECEIPTS.

For water	$52,036 04	
From city to lay water pipe	4,604 37	
From Mygatt & Morley to lay waste pipe	336 26	
From City Fund to pay interest on Water Bonds	38,000 00	
From Ocean Bank, deposit	1,000 00	
On construction account for scrap iron sold	18 12	
		$95,994 79
Cash on hand January 1, 1867		385 99
		$96,380 78

EXPENDITURES.

For running expenses	$14,246 06	
For repairs	3,685 79	
For returned water rent	173 59	
For pipe extension	36,662 48	
For interest on temporary loans	223 34	
For labor and material on construction account	13 48	
For amount forwarded Ocean Bank to pay interest on bonds	37,100 00	
For amount forwarded Ocean Bank as deposit	900 00	
For amount paid R. D. Wood & Co., balance on pipe	3,160 94	
		$96,165 68
Cash on hand January 11, 1868		215 10
		$96,380 78

The outstanding liabilities of the Water Works, excepting the bonded debt, probably do not exceed the amount of cash on hand.

The following table exhibits the aggregate yearly receipts for water, and the expenditures for running expenses and repairs, from the time of the introduction of lake water into the city until the present date; also, the earnings after deducting such expenditures:

Years.	Receipts for Water.	Running Expenses.	Repairs.	Receipts for water less run'ng expenses and repa's.
1856 to 1859, inclusive............	$34,528 73	$29,845 49	$2,996 08	$ 1,687 16
1860	16,793 60	7,683 80	1,734 38	7,375 42
1861	17,097 85	7,768 36	1,350 84	7,978 65.
1862	22.730 53	8,086 19	1,291 29	13,353 05
1863	23,421 30	10,011 96	835 54	12,573 80
1864	33,389 49	13,573 26	1,953 49	17,862 74
1865	40,888 01	17,346 56	1,382 21	22,159 24
1866	45,363 70	14,277 13	8,818 77	22,267 80
1867	51,862 45	14,246 06	3,685 79	33,930 60

It will be seen by reference to this table, that the receipts for water in the year 1867 exceeds that of the year 1866 the sum of $6,498.75, and that the receipts for water for the same year, less running expenses and repairs, are in excess of that for the previous year the sum of $11,662.80.

Respectfully submitted,

H. C. HAWKINS,

Secretary.

TWELFTH ANNUAL REPORT

OF THE

Superintendent and Engineer

OF THE

CLEVELAND WATER WORKS.

To the Board of Trustees of Water Works:

Gentlemen: In submitting this, my first Annual Report of the condition of the Water Works, I have deemed it advisable to follow the plan adopted by my predecessor, in beginning at the source of supply, and following the works through their different parts to the distribution of the water.

I. INLET TOWER AND AQUEDUCT.

At a recent examination of these parts of the works, it was found that some malicious person or persons had removed the iron straps or hasps used to hold the hatches of the inlet tower in their places, thus allowing two of them to be washed away by the first heavy sea that struck them, and a third one to be thrown into the space over the inlet pipe. It will be necessary to have them replaced at once.

The timber work and piling of the inlet tower is beginning to shows signs of decay, but not to such an extent as to require renewal this season. In other respects, the inlet is in good condition.

At the same time the examination of the inlet tower was made, the water in its immediate vicinity, and for a distance of 500 feet north and 3,200 feet west of it, was tasted, for the purpose of ascertaining to what extent the petroleum odor and taste, so much complained of recently, had been distributed; but no perceptible difference was found at any of the places where the water was tried, all being equally impregnated with the taste of petroleum, showing conclusively that the quality of water now furnished is as good as could be obtained at any point within a reasonable distance west of the present inlet. The water, at the time the examination was made, was perfectly clear to look at, but had a taste that was extremely nauseating. On the following Tuesday, by your directions, a communication was addressed to the City Council, setting forth the facts as above stated, and also giving a brief statement of an examination made by yourselves of what was believed to be the principal source from whence the material thus polluting the water came. The communication was referred to a committee consisting of the Board of City Improvements and the Board of Health; but up to this meeting no action has been taken, the water still having the same strong taste of petroleum and remaining, as before, perfectly clear.

The water, when thus impregnated, is unfitted for general domestic use, and there is no doubt that unless the evil is soon corrected the use of lake water for such purposes will, to a great extent, be abandoned. Such a state of things must necessarily produce feelings extremely prejudicial to the interests and prosperity of the water works, and demand such prompt and decided action as shall restore at once in the minds of consumers the confidence they have always had in the source of supply.

Two different plans were suggested in last year's report for remedying the evil; either of which, if carried out, would no doubt be effectual. The first was the strict enforcement of the law prohibiting the pollution of the water in the Cuyahoga river, or any of its tributaries, within a specified distance from its outlet. The second plan proposed, was to build a tunnel under the lake to such a distance as would ensure an uninterrupted supply of pure water at all times. The latter plan, if carried out, would undoubtedly give the greatest satisfaction, and would forever put an end to the complaints annually made about the impure state of the water.

It has not been ascertained to what distance the impure water extends north, as the ice, up to this time, has not been strong enough to permit measurement to be made over it with safety to a greater distance than that stated above; consequently, no estimate of the cost of such an undertaking has been made. But if the project is at all practicable—which can only be determined after a thorough examination of the nature of the earth under the lake has been made—it cannot cost as much as has generally been supposed. The subject is worthy of careful investigation and an accurate estimate, and with a view to making such an estimate, the preliminary surveys have been commenced, and when completed, a detailed report will be laid before you, of the cost and extent of the work deemed necessary.

During last year, the proprietors of the property abutting upon the street through which the aqueduct is built, caused the street to be raised about two feet above its former level, covering the man holes, or openings into the aqueduct, entirely. These will have to be raised to the grade of the street. In all other respects this part of the works is in good condition.

ENGINE HOUSE AND LOT.

Several repairs and improvements, proposed in the report of last year, were postponed on account of the great demand for pipe laying, but this year will have to be attended to. The planking of about one-half of the coal dock was renewed, and the other half will be renewed early in the spring, when the coal now on it is removed. Some temporary repairs have been made to the coal bins, but only such as the immediate necessity demanded; they should be replaced by new and substantial ones, of a size to correspond with the increasing demand for water.

According to the report of the Engineer in charge of the engines, they are both in excellent working condition.

The east engine was stopped on two different occasions during the past year; first on the second day of August, by the fracturing of the lower valve chamber of the main pump of the east engine, and again by the fracturing of the stop valve chamber between the west main pump and stand pipe; both of these fractures were substantially repaired by bracing them with heavy wrought iron clamps.

The body of the stop valve chamber and the lower valve chamber of the west main pump, have a slight vibration that should be remedied, either by putting in the new lower chamber that was ordered, or by keying up and bracing the old one.

The boilers and furnaces are in good repair, and will probably need no other work done on them than the annual removing of the lining of the furnaces.

A small water pipe, with draw cock at the end, has been placed in each boiler room, for the purpose of drawing water for wetting the coal and ashes; thus supplying a necessity that has been felt ever since the erection of the works.

The want of an apparatus in the engine house for determining the elevation of water in the reservoir, is very much felt, and could be supplied by extending the eight-inch waste pipe to the engine house, a distance of between three hundred and four hundred feet. By placing a stop gate at the end of it, and opening the waste gate at the reservoir, the pipe would fill with water; from this pipe, carry a small service pipe into the engine room, with a pressure gauge attached, and the object would be accomplished. By doing this, the trouble of sending from the engine house to the reservoir three times a day, a distance of three-fourths of a mile each way, would be obviated. This, with the saving of fuel by knowing just when to stop the engines, would soon pay the cost of the work proposed.

There has been an uninterrupted supply of water throughout the year, the average minimum depth in the reservoir having been 16 294-1000 feet.

The engines worked during the year 316 days, the average running time per day being 12 hours and 35 minutes, and a per diem increase of 1 hour and 40 minutes.

Number of strokes of east engine	835,875
Number of strokes of west engine	1,333,500
Total number of strokes	2,169,375

Average height above surface of Lake Erie to which the water was raised, 157 439-1000 feet.

Duty of east engine	37,022,693
Duty of west engine	38,026,854

pounds of water raised one foot high with every one hundred pounds of coal (bituminous slack) consumed for raising steam and pumping, without deductions for cinders and ashes.

The annexed Schedule A gives the engine record for 1867, and B the aggregate performance of both engines for each year to January 1st, 1868.

Schedule C gives the monthly and daily averages of water consumed during the year, and the totals and averages for previous years. This schedule also gives annual increase in the consumption of water, showing for 1867 an increase of 18.55 per cent. over 1866.

RESERVOIR.

The benefits resulting from the employment of a reservoir keeper are apparent from the fact that it needs no repairs excepting the renewal of a portion of the brick lining of the inside slopes. The grass on all parts of it appears to be in a healthy and thriving condition. The paths made by persons running up and down the outer corners of the embankment have disappeared, and are now nearly covered with a thick sod.

The new flight of stairs ordered last season have not been built yet, the old ones, with slight repairs made by the keeper, having answered very well for another year; but they should be removed and new ones built this season.

The necessity for increased reservoir capacity has so often been discussed, and is so well understood, that a mere statement of the fact that, at the present rate of consumption, the reservoir holds on 2 3-4 days' supply of water, is all that is necessary at this time.

A new location for a reservoir of large capacity has been proposed, the merits of which will be investigated and form the subject of a special report, should they be found at all encouraging.

DISTRIBUTION.

The whole pipe system is in good condition, and but two leaks of any consequence have occurred during the year; one caused by the fracturing of a valve chamber on the branch from the pumping main, intended to connect with the twenty-inch distributing main, and one, subsequently, at the same place, caused by the blowing off of the solid cap placed on the end of the same branch when the broken branch was removed.

The large leak in the sixteen-inch main, where the wrought iron river pipe joins the cast iron land pipe at the east bank of the river, was successfully repaired. This leak had been increasing in size from the time the water was first let into the pipe, and had worn the joint so much as to render it necessary to have a cast iron clamp made to cover the whole, and then to fill the space between the pipe and clamp with lead.

Early in May last, the earth covering the sixteen-inch main where it crosses what is known as the "Scranton Hill," situated just west of the C., C. & C. Railroad track, was washed away to such an extent as to leave the pipe entirely exposed, and rendering it necessary to lower the same about twelve feet. At the same time a new sixteen-inch valve was placed just at the foot of the hill, so that hereafter, if it should become necessary to lower this pipe still more, the water will not have to be shut off from that portion of the flats in the vicinity of Seneca street extension while doing so.

During the fall the City Council caused the grade of Detroit street, at the top of the hill, to be lowered about eighteen inches, leaving only about 18 inches of covering on the 20-inch distributing main, and making it necessary to lower it about two feet at the summit of the hill. This was successfully accomplished without interrupting the supply of water on the east side of the river for an hour.

New pipe laid during the year was 13,609.5 feet, or 2.577 miles, making a total length now in use 36.957 miles. In addition to this, 7,822.5 feet of cement pipe was taken up, and cast iron pipe laid down in its stead.

Schedule D gives the size, length and location of the pipes laid during the year, with the length of all pipes previously laid.

Schedule E gives the size, location and number of the different stop gates set during the year with a tabular statement of all set previous to 1867.

Schedule F gives the number and location of new fire hydrants set during the year.

The number and size of new service pipe connections made during the year is as follows:

2 inch connections	1
1 1-2 in connections	1
1 in connections	7
3-4 in connections	50
5-8 inch connections	439
Total	498

The whole number of service pipe connections made with the distributing pipes, up to January 1st, 1868, was 2,351; the different sizes and number of each size will be seen below:

4 inch connections	4
3 inch connections	3
2 inch connections	22
1 1-2 inch connections	11
1 inch connections	74
3-4 inch connections	195
5-8 inch connections	2,042
Total connections	2,351

The expenditures for the past year were, according to certified vouchers, as follows:

1.—RUNNING EXPENSES.

Pay rolls for 12 months	$ 10,518 81	Court fees	$ 4 85
Coal	2,238 53	Jos. Singer, extra services	166 67
Soap	29 90	Anti-incrustative mixture	29 50
Hardware	58 40	Ice for office	9 30
Books, stationery and printing	195 40	Plumbing	9 50
Rent of store room	128 75	Fire brick and clay	15 00
Oil	188 81	Small stores	24 05
Brass work	592 72		$ 14,392 31
Mutton tallow	78 62	Received for sundries	35 76
Iron work	104 00		

Net expenditures—running expenses . . . . $ 14,356 56

2.—REPAIRS.

Pay rolls for 12 months	$ 2,617 46	Iron pipe and cement	$ 23 69
Teaming	108 00	White and red lead	12 75
Carpenter work and lumber	82 28	Hardware	12 60
Mason work	67 00	Plumbing	27 73
Paving	358 90	Wood and coal	26 38
Oil	4 40	Fire brick	8 50
Iron work	788 69	Repairs on dock	154 15
Brass work	17 25		
Twine	18 56		$ 4,420 54
Lead	92 20	Received for sundries	879 70

Net expenditures—repairs . . . . $ 3,540 84

3.—CONSTRUCTION FUND.

Received for scrap iron	$18 12
Paid Bower for plumbing	13 48
Receipts over expenditures	$ 4 64

4.—PIPE EXTENSION.

Pay rolls for 12 months	$ 4,934 48	Damages	$ 75 00
Iron work	31 02	Warehouse charges	125 34
Brass work	28 00	Stop-gates	1,487 88
Paving	160 82	Wood plugs	25 83
Carpenter work	26 48	Printing	7 50
Cement and iron pipe and laying	3,182 48	Plumbing	284 82
Hemp packing	63 85	Pig lead	2,359 21
Cast iron pipe	24,330 97		$ 37,511 29
Wood and coal	65 30	Received for sundries	1,498 35
Water lime, cement and clay	298 60		
			$36,012 94
Deduct credit to construction fund			4 64
Net expenditures, pipe extension			$ 36,008 30

Total cost of Water Works to December 31st, 1867 . . . . $690,232 70

It is proposed by the city authorities to grade and improve Center street between the River and Old River Bed early in the spring, cutting the street, at its summit, to a depth several feet below the water pipe; the pipe being cement and iron, and not in good condition, will have to be taken up, and should be replaced with cast iron pipe. At the same time this is done, the pipe should be connected with the twenty-inch main at Detroit street, for the purpose of affording a better supply of water on the flats adjacent to the Old River Bed. Provision will also have to be made for laying a six-inch pipe in Seneca street extension early in the spring, as the contractor for the grading and paving will begin work as soon as the weather is settled.

Several other streets are spoken of in connection with the improvements to be made this year in the way of paving, grading, etc., in which there is no water pipe, and there are a few cases where the pipe will have to be taken up and relaid. The pipe in Perry street, between Cedar and Kinsman streets, is in a bad state of preservation, and the building of a main sewer through the street will certainly disturb, if not destroy, the whole line of pipe, it being cement. It is recommended that, as the sewer progresses, the pipe be taken up and a six-inch iron pipe laid in its place. By so doing, the pipe in Kinsman street will be better supplied than it ever has been.

Respectfully submitted,

JOHN WHITELAW,
Superintendent and Engineer.

Cleveland, January 31st, 1868.

SCHEDULE A.

ENGINE RECORDS FOR 1867.

East Engine.

Months.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped	Hight		Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet.	Decml's.	
March	76	30	40,200	10,100	39,900	50,000	12,904,200	157,737		34,143,391
April	283	25	145,350	20,400	138,400	158,800	46,657,350	157,359		38,660,782
May	273	30	142,300	19.200	133,800	153,000	45.678.300	156,843		39,433,241
July	40	30	23,450	4,800	22,400	27,200	7,527,450	156,666		36,259,846
August	22	55	13,150	3,600	13,000	16,600	4,221,150	156,833		33,343,087
September	324	15	197,675	18,000	191,000	209,000	63,453,675	157,386		39,948,442
October	124	00	65,775	8,400	70,200	78,600	21,113,775	157,858		35,459,400
November	171	40	91,000	11,600	99,400	111,000	29,211,000	158,249		34,833,572
December	224	20	116,975	14,400	135,800	150,200	37,548,975	158.384		33,111,620
To'ls & avr'gs.	1,541	05	835,875	110,500	843,900	954,400	268,315,875	157,478		37,022,693

West Engine.

January	310	55	173,675	20,800	175,800	196,600	55,749,675	157,672		37,389,975
February	274	30	154,100	19,200	157,200	176,400	49,466,100	157,713		36,984,802
March	201	45	111,725	15,000	113,600	128,600	35,863,725	157,548		36,741,942
May	36	20	19,425	5,400	18,200	23,600	6,235,425	156,666		34,611,289
June	338	20	192,175	19,800	187,600	207,400	61,688,175	156,423		38,840,565
July	339	30	199,825	16,500	192,700	209,200	64,143,825	156,624		40,151,786
August	357	35	225,450	19,400	198,600	218.000	72,369,450	156,883		43,545,131
September	13	00	7,450	5,400	7,600	13,000	2,391,450	157,500		24,225,813
October	210	40	120,900	12,600	123,000	135,600	38,808,900	157.749		37,755,468
November	542	05	75,400	13,600	84,600	98,200	24,203,400	158,166		32,599,011
December	104	25	53,375	12,000	59,600	71.600	17,133,375	158,468		31,708,387
Tol's & av'r'gs	2,329	05	1,333,500	159,700	1,318,500	1,478,200	428,053,500	157,400		38,026,854

Both Engines.

To'ls & avr'gs.	3,870	10	2,169,375	270,200	2.162,400	2,432,600	696.369,375	157,439		37.685.498

SCHEDULE B.

AVERAGE ENGINE RECORDS FOR ALL YEARS SINCE COMPLETION OF WORKS.

East Engine.

Years.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped	Hight		Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet.	Decml's.	
1857	693	35	231,354	118,850	235,220	354,075	73,626,095	158.000		29,604,192
1858	524	15	197,486	107,850	190,725	298,575	62,847,939	156.533		31,202,484
1859	668	15	300,064	111,750	262,050	373,800	95,420,352	155.896		35,329,535
1860	999	20	453,318	142,600	377,050	519,650	144,154,124	156.499		36,276,689
1861	1,066	45	509,785	131,550	415,900	547,450	162,111,630	156,424		38,690,736
1862	1,224	15	603,407	142,200	572,693	714,899	191,883,426	156.410		35,102,083
1863	1,187	35	605,475	132,788	559,500	692,288	194,357,475	156.693		36,788,845
1864	1,269	50	681,800	126,450	643,068	769,524	218,857,800	157,348		37,424,474
1865	1,507	00	835,525	147,600	799,400	947,000	268,203,525	158.084		37,441,769
1866	1,650	05	902,175	128,300	943,300	1,071,600	289,598,175	157.634		35,625,991
1867	1,541	05	835,875	110,500	843,900	954,400	268,315,875	157.478		37,022,693

West Engine.

Years.	Hours.	Minutes.	Strokes.	Raising Steam.	Pump'g.	Total.	Gallons Water Pumped	Feet.	Decml's.	Duty.
1857	512	50	168,540	107,350	172,100	277,450	53,636,170	158.000		28,321,942
1858	630	40	249,238	142,200	239,600	363,700	79,307,495	156.533		31,704,166
1859	744	45	323,691	121,300	287,550	408,850	102,813,738	155.958		36,065,129
1860	811	45	364,985	116,150	330,900	447,050	116,066,230	156.433		34,137,118
1861	1,040	50	503,344	132,050	438,250	571,300	160,063,392	156.440		36,405,441
1862	1,122	50	559,087	134,640	542,434	671,074	177,789,666	156,303		34,317,546
1863	1,402	55	705,400	149,115	709,918	809,033	236.433,400	156.694		34,541,163
1864	1,578	20	801,425	148,288	802,500	950,788	257,256,425	157.278		35,588,054
1865	1,464	40	775,880	139,350	780,150	919,500	249,057,480	157,950		35,778,436
1866	1,671	30	927,645	148,500	982,100	1,130,600	297,774,045	157.829		34,763,110
1867	2,329	05	1,333,500	159,700	1,318,500	1,478,200	418,051,500	157.400		38,026,854

TOTALS AND AVERAGES OF BOTH ENGINES TOGETHER FOR EACH YEAR.

Years.	Hours.	Minutes.	Strokes.	Raising Steam.	Pump'g.	Total.	Gallons Water Pumped	Feet.	Decml's.	Duty.
1857	1,206	25	399,894	226,200	407,325	633,525	127,292,264	158.000		29,003,067
1858	1,154	55	446,724	232,050	430,225	662,275	142,155,434	156.433		31,453,325
1859	1,413	00	623,755	233,050	549,600	782,650	198,234,090	155,927		35,697,332
1860	1,811	05	818,303	298,750	707,950	966,700	260,220 354	156.466		35,206,903
1861	2,107	35	1,013,129	265,600	854,150	1,118,750	322,175,022	156.432		37,548,089
1862	2,347	05	1,162,494	276,846	1,115,127	1,391,978	369,678,092	156.357		34,720 024
1863	2,590	30	1.310,875	281.903	1.169,418	1,551,321	420,790,875	156.693		35,535,438
1864	2,848	10	1,483,225	274,744	1,445,568	1,720,372	476.114,225	157,313		36,410,146
1865	2,971	40	1,611,405	286,950	1,579,550	1,866,500	517,261,005	158,017		36,621,770
1866	3,321	35	1,829,820	276,800	1,925,400	2,202,200	587,372,220	157,731		35,304,587
1867	3,870	10	2,169,375	270,200	2,162,400	2,432,600	696,369,375	157.439		37,685,498

SCHEDULE C.

SHOWING THE DISTRIBUTION OF WATER IN EACH MONTH IN 1867.

Months.	Gallons Distributed.			
	Per Month	Av'g per day	Each in. per day.	E'ch con. per day.
January	55,749,675	1,798,376	22.48	109.03
February	49,466,100	1,766,647	22.01	107.31
March	48,767,925	1,573,159	19.66	95.63
April	46,657,350	1,555,245	19.44	94.54
May	51,913,725	1,674,636	20.93	101.80
June	61,688,175	2,056,272	25.70	125.00
July	71,671,275	2,311,976	28.90	140.54
August	76,590,600	2,470,664	30.88	150.19
September	65,845,125	2,194,837	27.43	133.42
October	59,922,675	1,932,989	24.16	117.51
November	53,414,400	1,780,488	22.25	108.25
December	54,682,350	1,763,947	22.05	107.23
Total and average	696,369,375	1,907,861	23.85	116.98

II.—TOTALS AND AVERAGES FOR ALL YEARS SINCE COMPLETION OF WORKS.

Year.	Gallons Distributed.				Per cent. of Increase.
	Per Year.	Av'gper day	Each in. per day.	Ea. con. per day.	
1857	127,262,265	348,664	7.75	110.68	11.10
1858	142,155,434	389,467	8.37	93.44	17.00
1859	198,234,090	513,107	11.31	91.27	39.45
1860	260,220,354	710,984	14.11	101.57	31.87
1861	322,175,022	881,599	16.32	114.50	23.81
1862	369,673,092	1,012,794	19.47	120.57	14.74
1863	420,790,875	1,152,851	20.97	117.54	12.83
1864	476,114,225	1,300,858	21.68	123.89	12.14
1865	517,261,005	1,417,153	21.80	123.70	8.64
1866	587,372,220	1,609,239	22.35	124.26	13.55
1867	696,369,375	1,907,861	23.85	115.98	18.55

SCHEDULE D.

SHOWING EXTENSION OF WATER PIPE IN 1867.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
10	Superior . . .	Erie and Dodge	2,231	....	Cast iron.
6	Lorain	Pearl and Fulton	2,466	....	Cement & iron
6	Hudson	Crossing Euclid	71	....	Cast iron.
6	Case av. . . .	Crossing Euclid	56	....	Cast iron.
6	Park	Crossing Euclid to south line	56	....	Cast iron.
6	Detroit . . .	Hanover and Kentucky	1,760	....	Cast iron.
6	Euclid	Park and Willson avenue	351.5	....	Cast iron.
6	Lorain	In Pearl	48	....	Cast iron.
6	Hudson . . .	Prospect and Cedar	830	....	Cast iron.
6	Sibley	Crossing Perry	6	....	Cast iron.
			———	6,544.5	
4	McLean . . .	In Lorain	4	....	Cement & iron
4	Ward	In Lorain	2	....	Cement & iron
4	Jersey	In Lorain	4	....	Cement & iron
4	Penn	In Lorain	4	....	Cement & iron
4	Wall	Crossing Detroit, south	30	....	Cast iron.
4	Green	In Lorain	2	....	Cement & iron
4	Fulton	In Lorain to west line	51	....	Cement & iron
4	Huron	Prospect and Euclid	146	....	Cement & iron
4	High	Middle and Sheriff	450	....	Cement & iron
4	Lawrence . .	St. Clair and Hamilton	180	....	Cement & iron
4	Hanover . . .	Detroit and Washington	407	....	Cement & iron
4	Willson	Brownell and east line of Park......	1,242	....	Cement & iron
4	Pittsburgh . .	In Jackson, east from west line	42	....	Cement & iron
4	Prospect . . .	Case avenue and Park	390	....	Cement & iron
4	Miami	Bolivar and Eagle	46	....	Cast iron.
4	Duane	Crossing Detroit, south	30	....	Cast iron.
4	State	Crossing Detroit, south	68	....	Cast iron.
4	Hanover . . .	Crossing Detroit, south	66	....	Cast iron.
4	Union	Superior and St. Clair	276	....	Cast iron.
4	Lake	Erie and Brownell	850	....	Cast iron.
4	Bond	St. Clair and Hamilton	70	....	Cast iron.
4	Frankfort . .	Bank and Seneca	455	....	Cast iron.
4	Long	Vineyard and Seneca	243.5	....	Cast iron.
			———	5,066.5	
3	Rockwell . . .	Fire hyd. con. bet. Bond and Erie..	8	....	Cast iron.
3	Euclid	8 fire hyd. con. bet. Perry and Will-		....	Cast iron.
3	Hudson	son avenue	192	....	Cast iron.
3	Cedar	1 fire hyd. con. opposite Sibley	12	....	Cast iron.
3	Columbus . .	1 cistern con. at Hudson	14	....	Cast iron.
3	Lorain	1 fire hyd. con. at Franklin..........	22	....	Cement & iron
3	Lorain	2 fire hyd. con. bet. Pearl & Fulton	41	....	Cast iron.
3	Detroit	2 cistern con. bet. Pearl & Fulton..	12	....	Cast iron.
3	Hanover . . .	3 fire hyd. con. bet. State & Kentk'y	58	....	Cast iron.
3	Hudson . . .	1 cistern con. at Washington........	8	....	Cast iron.
3	Lake	1 fire hyd. con. at Prospect	12	....	Cast iron.
3	Willson . . .	1 fire hyd. con. bet. Muirson and		....	Cast iron.
3	Superior . . .	Brownell	31	....	Cast iron.
3	Perry	3 fire hyd. con. bet. Brownell & Park	56	....	Cast iron.
3	Long	4 fire hyd. con. bet. Erie & Dodge..	154	....	Cast iron.
		1 fire hyd. con. bet. Prospect & Cedar	17		
2	Lake	3 fire hyd. con. bet. Vineyard and		644	
		Seneca	7	———	
			———	23.5	13,609.5 feet, or
		Branch for skating rink	23.5		2.577 miles.

SCHEDULE D.—Continued.

CEMENT AND IRON PIPE TAKEN UP AND REPLACED WITH CAST IRON PIPE.

Tak'n up Diam. in.	Laid in place. Diam. in.	Street.	Between What Streets.	Length feet.	Total feet.
16	16	Franklin	Crossing Columbus	76	....
					76
10	10	Prospect	Crossing Hudson	15	....
					15
8	8	Columbus	Crossing Franklin	33	....
8	8	Merwin	Crossing Center	20	....
					53
6	6	Detroit	Pearl and Terrace	220	....
					220
4	6	Detroit	Pearl and Hanover	547	....
4	6	Perry	Prospect and Cedar	843	....
4	6	Euclid	Perry and Willson av.	5,888.5	
4	6	Cedar	Crossing Perry	39	....
					7,317.5
4	4	Franklin	Crossing Columbus	76	....
					76
3	3	Euclid	Fire hydrant con., bet. Perry and Hudson...	18	....
3	3	Detroit	Fire hydrant con. at Hanover	18	....
3	3	Perry	Fire hydrant con. bet. Prospect and Cedar.	29	....
					65
					7,822.5 or 1.482 miles.

PIPES LAID TO DECEMBER 31, 1867.

Diameter in inches..	24	20	16	10	8	6	4	3	2
Previous to 1867......	2,668	10,913	12,454	9,511	14,457.5	23,206.75	101,857.25	5,635	794
Laid in 1867...........	.....	......	......	2,231	....	12,962.00	taken up	644	23.5
	.....	......	......	......	....	....	2,251.00	.....	.....
	2,668	10,913	12,454	11,772	14,457.5	36,168.75	99,606.25	6,279	817.5
		26,035					169,101		

26,035 feet, or 4.931 miles of supply main, and
169,101 feet, or 32.026 miles of distributing pipes.

195,136 feet or 36.957 miles in all.

SCHEDULE E.

I. GIVING SIZE, NUMBER AND LOCATION OF STOP-GATES IN THE STREETS IN 1867.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	16	Franklin	West line of Columbus.
1	16	Girard	West line of C., C. & C. R. R.
2	16	inch gates.	
1	10	Superior	East line of Erie.
1	10	Superior	East line of Muirson.
1	10	Superior	West line of Dodge.
3	10	inch gates.	
1	6	Lorain	West line of Pearl.
1	6	Lorain	West line of York.
1	6	Lorain	West line of Jersey.
1	6	Lorain	West line of Penn.
1	6	Lorain	West line of Fulton.
1	6	Euclid	872 feet east of Perry.
1	6	Euclid	East line of Hudson.
1	6	Euclid	1,260 feet east of Hudson.
1	6	Euclid	East line of Case avenue.
1	6	Euclid	East line of Park.
1	6	Euclid	West line of Willson avenue.
1	6	Hudson	North line of Euclid.
1	6	Hudson	South line of Prospect.
1	6	Hudson	North line of Cedar.
1	6	Case avenue	North line of Euclid.
1	6	Park	South line of Euclid.
1	6	Perry	South line of Prospect.
1	6	Perry	South line of Cedar.
1	6	Cedar	East line of Perry.
1	6	Detroit	East line of Hanover.
1	6	Detroit	East line of State.
1	6	Detroit	East line of Duane.
1	6	Detroit	East line of Kentucky.
23	6	inch gates.	
1	4	Lake	East line of Muirson.
1	4	Fulton	North line of Lorain.
1	4	Duane	South line of Detroit.
1	4	State	South line of Detroit.
1	4	State	North line of Detroit.
1	4	Hanover	North line of Detroit.
1	4	Hanover	South line of Detroit.
1	4	Wall	South line of Detroit.
1	4	Union	North line of Superior.
1	4	Long	East line of Vineyard.
1	4	Frankfort	West line of Seneca.
11	4	inch gates.	

RECAPITULATION.

2	16	inch stop-gates.	27	3	inch stop-gates for Fire Department.
3	10	inch stop-gates.	10	3	inch stop-gates for cistern connec'ns.
23	6	inch stop-gates.	....	....	
11	4	inch stop-gates.	....	....	
39		in all for st. use	37	....	76 total for all purposes.

II. TABLE SHOWING NUMBER OF STOP-GATES SET IN THE STREETS TO DECEMBER 31ST, 1867.

Water way in inches......	24	20	16	10	8	6	4	3	2	Total.
Previous to 1867	2	13	14	11	29	51	250	34	3	407
Set in 1867	.....	.....	2	3	.....	23	11	37	.....	76
Taken up in 1867	.....	1	.....	.....	.....	.....	8	.....	.....	9
Total	2	12	16	14	29	74	253	71	3	474

SCHEDULE F.

GIVING NUMBER AND LOCATION OF FIRE HYDRANTS SET IN 1867.

No.	STREET.	BETWEEN.	Side of Street.
1	Rockwell	Bond and Erie	North.
1	Euclid	Perry and Hudson	North.
1	Euclid	Hudson and Case avenue	North.
1	Euclid	Hudson and Case avenue	South.
1	Euclid	Hudson and Case avenue	North.
1	Euclid	East side of Case avenue	South.
1	Euclid	Opposite east side of Park	North.
1	Euclid	West side of Wilson avenue	South.
1	Hudson	Opposite south side of Sibley	East.
1	Hudson	North side of Prospect	East.
1	Columbus	North side of Franklin	East.
1	Lorain	West side of York	North.
1	Lorain	Penn and Green	South.
1	Detroit	East side of Kentucky	South.
1	Detroit	East side of Duane	South.
1	State	South side of Church	East.
1	Lake	Muirson and Brownell	North.
1	Willson	Brownell and west of Park	South.
1	Willson	Opposite west side of Park	North.
1	Willson	On east line of Park	South.
1	Superior	Erie and Muirson	South.
1	Superior	East side of Muirson	North.
1	Superior	Muirson and Dodge	South.
1	Superior	Muirson and Dodge	North.
1	Long	Vineyard and Seneca	North.

25 new fire hydrants set in 1867.
183 fire hydrants set previous to 1867.

208 Total number now in use.

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ANNUAL REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

FOR THE YEAR

1868.

REPORT

OF THE

BOARD OF TRUSTEES

OF

WATER WORKS

OF THE

CITY OF CLEVELAND

For the Year 1868.

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REPORT

OF

Trustees of Water Works.

Office of the Water Works, Cleveland, January 1, 1869.

To the Honorable Mayor and City Council of the City of Cleveland:

The undersigned herewith submit for your consideration the Thirteenth Annual Report of the Superintendent and Secretary of the Water Works, which reports will, we trust, sufficiently show the operations of the Department for the past year.

Plans are being prepared for the extension of the inlet in order to obtain a supply of water free from unpleasant or injurious substances, and when approved and adopted by the Board, your action will be requested in furtherance of this object.

Respectfully,

WILLIAM BINGHAM,
E. M. PECK,
Board of Trustees of Water Works.

THIRTEENTH ANNUAL REPORT

OF THE

Superintendent and Engineer of the Cleveland Water Works.

To the Board of Trustees of Water Works:

Gentlemen: The undersigned would respectfully present this the Thirteenth Annual Report upon the condition of the Water Works:

I. INLET TOWER AND AQUEDUCT.

The only repairs necessary to be made upon these parts of the works during the past year was the renewal of the hatches of the inlet tower as recommended in last year's report. During the months of January and February of last year experiments were made and observations taken on the ice with a view of ascertaining if possible how far north the water in the lake was impregnated with the petroleum taste which has been such a source of annoyance for three winters past. For this purpose measurements were taken at right angles from the shore line at the inlet and east and west of the same. Holes were cut in the ice at short intervals and the water tasted, at the same time the line running out from the inlet was measured and soundings were taken for the purpose of making a profile of the bottom of the lake along the line.

After repeated observations, it was found that the whole body of water, bottom as well as surface, for a distance of 4,300 feet north from the shore line and parallel thereto, and for a distance of two miles west and one mile east of the river was tainted with the taste of petroleum during the whole time the ice covered it. No ice barrier had been formed across the mouth of the river as in former winters to turn the current out of its natural channel, and the theory that this ice barrier or dam turning the water from the river in a westerly direction to the inlet pipe was the cause of the petroleum taste in the water must be abandoned, for we find the [illegible] [illegible] a mile [illegible] of the river and out in the lake far beyond the sand bar upon which the ice in former years has lodged and formed a wall. The last trace of impure water was found at a distance of 3,800 feet north from the inlet, and in thirty feet of water. From this point measurements were made and soundings taken to a distance of 2,200 feet still farther north and the water found to be uniformly clear and tasteless. It is believed that a tunnel under the lake 6,600 feet long from the well—at the junction of the inlet pipe with the aqueduct—would at least insure a supply of water free from any impurities discharged by the river, but that distance would not reach water that would at all times be clear, as it is well known that the water in the lake is frequently discolored for several miles out by the agitation of the clay on the bottom, even in Chicago with a tunnel two miles long the water furnished is not at all times clear, but the location of the inlet of a tunnel as here proposed would be even more favorable than that of the Chicago tunnel, for while ours would be a mile up the lake from our river and in water over thirty-five feet deep, theirs is but a short distance below the mouth of their harbor and in water less than thirty-five feet deep.

After the examinations as to the quality of the water had been concluded, two holes were sunk into the clay on the shore near the inlet pipe to the depth of 80 feet and the material at that depth and indeed all of it with the exception of a covering of sand about eighteen feet in thickness, was found to be extremely favorable of building a tunnel through, being dry and tough blue clay. When these borings were finished it was thought best to sink a hole in the engine house lot, and in case the clay was found to be as good there as at the inlet, plans for a tunnel running directly out from the Engine House lot were to be made, but the material not being such as was desired or deemed safe to work through, after sinking a hole 100 feet in depth through alternate layers of quicksand, clay and gravel until the shore rock was reached, the thought of making that the starting point was abandoned. Several attempts were made during the summer to sink holes in the clay out in the lake, but one of which, in the night of the 26th of August, was successful. This hole was bored at a point about 300 feet west of where a direct line in continuation of our present inlet pipe would strike and about 6,000 feet from shore, the water at that point is thirty-five feet deep, and a hole was bored in the clay thirty-nine feet below the bottom of the water or seventy-four feet below the surface. The clay at this place was found to be even more compact than on land. Subsequent efforts to sink other intermediate holes were unsuccessful, and the season being so far advanced the hope of sinking other holes before winter was abandoned.

For the last three winters the lake has been covered with ice for at least a portion of each winter, sufficiently strong to work upon; and with the hope that such would be the case again this winter we have been waiting for ice to form so that we might carry on our work to better advantage and at less cost, but up to this time we have been unable to do anything on account of *the open* weather, but as no ice has been formed on the lake in this vicinity we have not been troubled with the petroleum taste in the water.

In April last, by your directions, your Superintendent and Engineer visited Chicago for the purpose of gaining information as to cost, mode of construction, working, etc., of the tunnel of that city, and while there, through the courtesy of Mr. Chesbrough, City Engineer, had access to the plans, estimates, etc., of the whole work. From those papers and other information kindly furnished by Mr. Chesbrough, we have every reason to hope that a tunnel can be successfully constructed to a distance of one and one-fourth miles under the lake for a sum within the amount appropriated by the City Council for that purpose. Admitting that the cost of labor and materials will be as great here as in Chicago, including all the extras allowed the contractors in their final estimates such a tunnel as we propose to build should cost the sum of $296,000 for land shaft, lake shaft and crib, and 6,600 feet of tunnel the same size as the Chicago tunnel, but the cost of the tunnel proper ought not to be as great here as in Chicago for the reason that it would not be as long, consequently less time would be lost in transporting materials out of and into it, but as the above sum does not include the cost of engineering and incidental expenses, and the cost of building crib and gate houses, and connecting with aqueduct, about 10 per cent., or say $29,000, should be added for these purposes, making a total of $325,000.

ENGINE HOUSE AND LOT.

The report submitted to you by the Engineer in charge of the engine is so full and complete, that little, if anything, need be added. It is as follows:

To the Board of Trustees of Water Works:

Gentlemen: In accordance with my duty I herewith submit a report of the condition of the pumping machinery, with the amount of work done and the repairs and improvements made during the past year.

The east engine was stopped on two different occasions. First on September 14th, on account of a leak in No. 2 east boiler, and again on December 7th by the fracturing of the main stop valve chamber between the east main pump and the stand pipe.

There has been an uninterrupted supply of w
the year, the average minimum depth in the
been 16 7-10 feet, being 4-10 of a foot more tha

The engines worked during the year 32
running time per day being fourteen hour
an increase of four days and a per diem inc
twenty-eight minutes.

Number of strokes made by east engine
Number of strokes made by west engine

Total number of strokes ....

Average height above surface of lake to which the water was raised 157 822-1000 feet.

Duty of east engine 45,021,292
Duty of west engine 44,072,868

pounds of water raised one foot high with each 100 pounds of bituminous slack coal consumed for raising steam and pumping.

The following are the repairs and improvements made during the year:

Renewed the wood floors over the main pump wells.

Put in new drain pipe between the cylinder jacket and boilers of the west engine.

Repaired a fractured steam pipe of the west engine.

Put new rivets in the main hole flanges of Nos. 1 and 2 west boilers.

Renewed the check valve rods and waste water valve rods between the feed pumps and boilers of both engines.

Erected a new wood fence across the engine room for the better protection of the engineer, visitors and those on duty.

Put in a new counter balance to the equilibrium valve gearing of both engines.

On the 14th of September—the first day of using the east boilers after cleaning them—a small leak was discovered in the flue of No. 2 boiler. The fires were immediately drawn, and the next day the west engine was put in operation. An examination of the leaky boilers revealed the fact that the leak was close to the joint of the water pipe connection between boilers Nos. 1 and 2. The boiler plates around the flange connections of this pipe were so much reduced in thickness by the constant contraction and expansion of the metal, that a part of two plates had to be cut out and new ones inserted. As a precautionary measure the brick work was removed between Nos. 2 and 3 boilers for the purpose of examining the plates around the joints of the water pipe between those boilers, and the result was that the same repairs had to be made as in Nos. 1 and 2 boilers.

It was thought best to remove the water connection pipes from between the boilers to the back end, which was accordingly done in a complete manner, and as soon as these boilers were again brought into use the west boiler pipe connections were examined and the plates found to be in nearly as bad a condition as those of the east boilers. They were repaired by putting in new plates and the water pipe connections changed to the back end, as in the east boilers.

On the 26th of November two stay bolts in No. 3 east boiler were removed on account of their heads breaking, and new and more substantial ones were put in their places.

In December the faces of the upper valve of the west main pump were refitted, and on the 7th day of the month at 9 o'clock P. M., while these repairs were being made, the main stop valve chamber between the east main pump and the stand pipe was fractured in the same manner as that of the west main pump in September, 1867, and was repaired by bracing it with six wrought iron clamps. The engine was set at work again at 9:15 P. M., on the following day.

The above repairs are all that have been required during the year, and the engines and boilers are now in excellent working order, but the condition of the valve chambers of both main pumps and stop valves is such as to require early attention, those of the west engine in particular, being not only fractured but the whole body of the chamber is weakened and has a slight motion at every stroke of the plunger, which must in time be productive of injury. These two chambers should be renewed at the earliest possible moment and new and stronger ones inserted.

I would here respectfully call your attention to the following much needed improvements:

1st. I would recommend that a hood or blank flange be made to fit the main pump discharge pipe branch on the stand pipe; to be used when necessary to disconnect the pipes between the pumps and stand pipe.

2d. To place eye bolts in the ceiling of the upper room of the engine house over the main beam journals for lifting off and on the caps when necessary.

3d. To protect the steam pipes and boiler ends from the waste of heat by radiation, an improvement that would soon pay for itself in the saving of fuel.

4th. Small cast iron doors to be placed in the brick wall in front of the boilers in line with the side flues, for convenience when cleaning or examining the flues.

5th. A small lever attachment to the dampers for their better adjustment.

The annexed Schedule A., gives the engine record for 1868.

All of which is respectfully submitted.

JOHN VIAL,
Engineer in charge.

It will be observed by an inspection of the engine records for the past year that a very gratifying improvement has been made in the duty of the engines over any previous year. This improvement is attributable to different causes, mainly, however, to the superior quality of coal used during the greater part of the year, but partially to the increased time of running, better firing, and improvements and repairs to the machinery. A still higher duty may be attained by carrying out the [illegible]mmendations of the Engineer in charge for protecting the [illegible] pipes and boilers from loss of heat by radiation.

The roof of the engine house and boile[illegible]ll need some repairs, and, together with the outside [illegible] of the whole building should be painted the com[illegible]

No work has been done upon the [illegible] year and they are consequently in a dilapidated condition and should be removed and larger ones built before winter sets in.

The coal dock has all been newly planked and is now in very good repair.

The accompanying Schedule "A" gives the engine record for the past year, and "B" the aggregate for both engines for each year since the completion of the works.

Schedule "C" gives monthly and daily averages of the consumption of water for the year, and the totals and averages for each year to December 31st, 1868.

The annual increase is also shown in this table. That for 1868 being 10 4-10 per cent over the consumption in 1867.

RESERVOIR.

The water in the reservoir was drawn off in the spring and the basins thoroughly cleaned, at the same time the brick paving above and below the ordinary water line was properly repaired by putting in about 8,000 new brick. It is earnestly recommended that when this work needs renewing again that stone flagging be substituted for the brick paving for at least a few feet above and below the water line.

The bridges have been repaired and the water gauges newly painted.

The turf on the embankments, and indeed throughout the whole lot, is in good condition. A compost heap is being prepared for spreading over the grass during next winter.

Many of the evergreens in the outer row have died during the year, and a number of the others appear to be in an unhealthy condition, but those in the inner row are all without exception, in a thriving and healthy condition.

The old stairs have answered for another year, but must be removed and new ones built this season, as they are too much decayed to be worth repairing.

A plan for a new flight will soon be laid before you, when it is hoped that an order will be issued to call for proposals for building them.

At the present rate of the consumption of water, the reservoir holds less than three days' supply when full, taking the average for the whole year, but during the month of July last, when the consumption was greatest, the daily average exceeded two and three quarter millions of gallons, at which rate of consumption a quantity of water equal to the entire contents of the reservoir was drawn off every fifty-two hours.

Taking the annual increase in the consumption of water at thirteen and a half per cent—which is about the average for the past six years—the reservoir in 1874 will hold but one day's supply, and both engines will then have to be worked fifteen hours per day to pump the water used. It is, therefore, evident that the time is near at hand when preparations will have to be made for an increase in pumping and storage capacity.

DISTRIBUTION.

Schedule "C" gives the monthly and total consumption of water for the year with the consumption for each year since 1856; it also gives the daily average, the average to each inhabitant, the average to each consumer, and the annual ratio of increase for each year since the completion of the works, showing for the past year an increase of 10 4-10 per cent.

Schedule "D" shows the extension of pipes for the year, the streets in which they are laid, the different sizes and length of each size, with a table giving a list of pipes taken up for the purpose of laying down larger ones. The length of pipe added during the year was 13,216 feet or 2 503-1000 miles, making the total length of supply mains and distributing pipes now in use 208,352 feet or 39 46-100 miles. In addition to the pipes enumerated in this table there were several lines of 3 and 4 inch pipe laid for private parties and Railroad Companies at their own expense and for their own use.

Schedule "E" gives the location, size and number of stop valves set in the streets during the year, with the number and different sizes of all set previous to 1868. The total number now in use, including 71 set for the Fire Department being 555.

Schedule "F" gives the number and location of new fire hydrants set and connected with the water pipes during the past year.

In addition to the number therein given eight new fire hydrants were set for the following named corporations and individuals and paid for by them respectively, viz: For C. & P. R. R. Co. at their freight depot, three; for C. C. & C. R. R. Co. at new Union freight depot, one; for Alexander, Scofield & Co. at their oil works, two; for Rose & Prentiss at their packing house, one; and for Stanley & Catlin at their oil works, one; any of which can be used by the Fire Department in case of need.

The number and size of new connections made with the distributing pipes during the year is as follows:

4 inch connections	1
3 inch connections	4
2 inch connections	2
1 inch connections	5
3-4 inch connections	5
5-8 inch connections	224
Total	241

The total number of connections made with [illegible] distributing pipes to January 1, 1869, was 6,592. The number of each size is as follows:

4 inch connections		5
3 inch connections		7
2 inch connections		24
1 1-2 inch connections		11
1 inch connections		79
3-4 inch connections	200	
5-8 inch connections	2,266	
Total		2,592

It will be seen by referring to the list of new service connections that the number added last year is less than half the number for 1867, but it must be remembered that at least one-half of the connections made in 1867 were in compliance with an order from the City Council requesting the owners of property abutting upon streets about to be paved, to make connections with the water pipes, and extend the service pipes to the sidewalks previous to the laying down of the pavement; therefore the number of new connections made in that year does not represent the real number of new customers added. The number of new customers secured in 1868 is about the same as in 1867.

But one leak of any consequence has occurred during the year, and that was caused by a break in the twenty inch supply main at the intersection of Euclid Avenue and Erie street; the crack, however, was a small one, and being in a vertical direction was easily repaired by covering it with a cast iron clamp and filling the space with lead. While this work was being done the consumers on the line of the St. Clair street pipe, east of Perry street, were deprived of the use of lake water for about twenty-four hours.

A new connection has been made between the twenty inch supply main and the eight inch pipe in Centre street, at Detroit street, as recommended in last year's report, and the section of the city supplied by that pipe is well provided for now.

A new line of pipe has been laid through Central Way from the Lower Central Way Bridge to the crossing of the Cleveland and Mahoning Railroad. The pipe under the river on this line is ten inches inside diameter, made of three-eighths inch boiler iron —220 feet long—and is laid eighteen feet below the ordinary water level. It was successfully lowered to its place on the 6th day of October, and on the 16th the connections were completed and the water let in and all the joints found to be perfect.

GENERAL REMARKS.

The expenditures for the year have been, as shown by certified vouchers in this office, as follows:

RUNNING EXPENSES.

Pay roll for 12 months	$11,955 91
Postage and revenue	31 45
Stationery and printing	207 00
Small stores	16 92
Lamps, chimneys, etc.	11 20
Oil	248 98
Plumbing	134 04
White and red lead	7 75
Express and team work	47 47
Carpenter work and lumber.	109 94
Hardware	60 94
Blacksmithing and iron work	1,313 73
Hauling coal to bins	398 15
Coal	3,749 50
Traveling expenses	44 85

Cleaning flues	$ 40 02
Cotton waste and freight	84 99
Rent	237 50
Soap	12 00
Rope	53 30
Fitting up office	194 17
Anti-incrustative mixture	22 50
Brass work	238 95
Mutton tallow	65 75
	$18,287 01
Received for sundries	106 20
Running expenses	$18,180 81

There is included in the above amount the sum of $929.67, which was expended for tools and labor required in sinking holes for the purpose of ascertaining the nature of the earth through which the proposed tunnel is to be built, and which should be deducted from running expenses, leaving

Running expenses	$17,251 14
Inlet extension	929 67

REPAIRS.

Pay roll for 12 months	$ 1,386 63
Express and team	172 30
Blacksmithing	815 58
Carpenter work and lumber	165 03
Brass work	23 01
Plumbing	108 26
Mason work, fire brick, clay	207 75
Hardware	8 05
Wood and coal	19 21
Paving	499 57
Castings	180 20
Damages	12 00

White and red lead	$ 14 55
Rubber pump valves	125 40
Repairing dock	192 05
Painting	19 80
Small stores	7 96
Hemp packing and twine	64 21
	$ 4,031 56
Received for sundries	479 37
Net expenditure—repairs.	$ 3,552 19

PIPE EXTENSION.

Pay roll for 12 months	$ 5,838 31
Brass work	68 50
Express and team work	767 11
Castings	1,926 17
Pig lead	2,476 61
Cast iron pipe	22,204 29
Printing	43 50
Carpenter work and lumber	31 38
Wrought iron river pipes	1,718 77
Hemp packing	87 13
Paving	89 80
Plumbing	253 21
Laying river pipe and docking	413 25

Meters	$ 157 00
Freight	6 04
Valves	1,725 80
Blacksmithing	131 18
Wood and coal	84 29
Hardware	32 65
Cash refunded to street sprinkler	50 65
Dredging	847 50
Small stores	3 02
	$38,956 16
Received for	6,915 53
Net expenditures—Pipe extension	040 63

The extension of pipe this season must ited,
for notwithstanding it is proposed to lay nd
a half miles, nearly all of it will be to
now in the streets, that are too small f

ply, and as the old pipes to be replaced with these new ones are nearly all of the cement and iron kind, they are worthless for the purpose of relaying. The estimated cost of the work proposed for the season is $35,000.00.

The total cost of the Water Works to December 31st, 1868, is as follows:

Cost of construction to December 31, 1858	$518,731 88
Cost of construction and pipe extension, 1859	25,098 05
Cost of construction and pipe extension, 1860	4,106 72
Cost of construction and pipe extension, 1861	3,727 87
Cost of construction and pipe extension, 1862	3,647 02
Cost of construction and pipe extension, 1863	7,964 34
Cost of construction and pipe extension, 1864	27,011 21
Cost of construction and pipe extension, 1865	29,090 59
Cost of construction and pipe extension, 1866	34,844 72
Cost of construction and pipe extension, 1867	36,008 30
Cost of construction and pipe extension, 1868	32,040 63
Total cost of works	$722,273 33

It will be seen by the Secretary's report that the earnings of the works over running expenses, and repairs for 1868 amounts to $36,340.23, being a little over five per cent. on the total cost of the Water Works to December 31, 1868.

Respectfully submitted,
JOHN WHITELAW,
Superintendent and Engineer.

Cleveland, January 31, 1869.

SCHEDULE A.

ENGINE RECORDS FOR 1868.

EAST ENGINE.

Months.	Pum'g		Strokes.	Coal Consumed for			Gallons Water Pumped.	Hight		Duty.
	Hours.	Minutes.		Raising Steam.	Pump'g.	Total.		Feet.	Dec'mls.	
January	228	10	119,550	16,600	123,000	139,600	38,375,550	158,666		36,474,429
February	98	00	51,600	7,200	52,400	59,600	16,563,600	159,203		37,000,892
March	210	15	112,975	12,600	99,800	112,400	36,264,975	158,761		42,836,130
April	240	43	118,300	16,000	74,800	90,800	37,974,300	157,703		55,155,176
May	288	20	126,475	11,200	112,600	123,000	40,598,475	157,135		43,951,563
June	161	10	84,990	11,000	64,200	75,200	27,281,790	156.791		47,568,856
July	302	40	177,235	4,200	135,200	139,400	56,892,435	156,850		53,582,075
August	193	55	111,650	3,600	98,400	102,000	35,839,650	157,346		46,226,619
September	15	45	7,550	3,200	7,600	10,800	2,423,550	157,333		29,518,461
October	351	10	180,825	8,000	167,400	175,400	58,044,825	158,107		43,754,220
November	102	25	50,725	3,200	51,200	54,400	16,282,725	158,059		39,569,127
December	251	55	131,750	2,100	113,500	115,600	42,291,750	158,439		48,454,732
To'ls & avr'gs.	2,444	28	1,273,625	98,900	1,100,100	1,199,000	408,833,625	157,866		40,212,920

WEST ENGINE.

January	119	15	59,750	7,200	71,600	78,800	19,179,750	158,516		32,264,677
February.........	260	45	140,675	18,000	147,400	165,400	45,156,675	159,032		36,307,493
March	150	20	77,000	13,400	66,600	80,000	24,717,000	157,878		40,790,563
April	102	25	52,275	7,800	40,400	48,200	16.780,275	157,603		45,891,059
May	103	40	54,700	8,400	33,600	42,000	17,558,700	157,364		55,025,583
June	210	40	108,600	14,000	84,600	98,600	34,860,600	156,833		46,371,581
July	153	50	89,650	6,800	61,700	68,500	28,777,650	156,666		55,042,427
August	200	35	119,850	6,000	108,200	114,200	38,471,850	157,051		44,245,479
September	320	15	191,400	3,600	168,800	172,400	61,439,400	157,829		47,145,246
October..........	36	20	20.700	....	17,200	17,200	6.644,700	157,832		50,988,874
November	244	35	129,275	7,800	113,800	121,600	41,497,275	158,217		45,152,830
December	156	05	77,475	6,200	64,600	70,800	24,869,475	158,524		46,567,279
To'ls & avr'gs	2,058	45	1,121,350	99,200	978,500	1,977,700	359,953,350	157,778		44,072,868

BOTH ENGINES.

Total av.	4,503	13	2,394.975	198,100	2,078,600	2.276,700	768,786.975	157,822		44,

SCHEDULE B.

AVERAGE ENGINE RECORDS FOR ALL YEARS SINCE COMPLETION OF WORKS.

EAST ENGINE.

Years.	Pum'g			Coal Consumed for			Gallons Water Pumped	Hight		Duty.
	Hours.	Minutes.	Strokes.	Raising Steam.	Pump'g.	Total.		Feet.	Decml's.	
1857	693	35	231,354	118,850	235,225	354,075	74,626,095	158.000		29,604,192
1858	524	15	197,486	107,850	190,725	298,575	62.847,939	156,633		31,202,484
1859	668	15	300,064	111,750	262,050	373,800	95,420,352	155.896		35,329,535
1860	999	20	453,318	142,600	377,050	519,650	144,154,124	156,499		36,276,689
1861	1,066	45	509,785	131,550	415,900	547,450	162,111,630	156.424		38,690,736
1862	1,224	15	603,407	142,206	572,693	714,899	191,883,426	156.410		35,102,083
1863	1,187	35	605,475	132,788	559,500	692,288	194,357,475	156.693		36,788,845
1864	1,269	50	681,800	126,456	643,068	769,524	228,857,800	157.348		37,424,474
1865	1,507	00	835,525	147,600	799,400	947,000	268,203,525	158.084		37,441,769
1866	1,650	05	902,175	....	....	1,071,600	289,598,175	157.634		35,625,991
1867	1,541	05	835,875	110,500	843,900	954,400	268.315,875	157,478		37,022,693
1868	2,444	28	1,273,625	98,900	1,100,100	1,199,000	408,833,625	157.866		45,021,292

WEST ENGINE.

1857	512	50	168,540	107,350	172,100	279,450	53,636,170	158.000		28.321,942
1858	630	40	249,238	124,200	239,500	363,700	79,307,495	156.533		31,704,166
1859	744	45	323,691	121,300	287,550	408,850	102,813,738	155.958		36,065,129
1860	811	45	364,985	116,150	330,900	447,050	116,066,230	156.434		34,137,118
1861	1,040	50	503,344	133,050	438,250	571,300	160,063,392	156,440		36.405,441
1862	1,122	50	559,087	134,640	542,434	677,074	177,789,666	156.304		34,317,546
1863	1,402	55	705,400	149,115	709,918	859,033	226,433,400	156.694		34,541,163
1864	1,578	20	801,425	148,288	802,500	950,788	257,256,425	157.278		35,588,054
1865	1,464	40	775,880	139,350	780,150	919,500	249,057,480	157,950		35,778,436
1866	1,671	30	927,645	148,500	982,100	130,600	297,774,045	157.829		34,763,110
1868	2,058	45	1,121.350	99,200	978,500	1,077,700	359,953,350	157,778		44,072,868
1867	2,329	05	1,333,500	159,700	1,318,500	1,478,200	428,053,500	157.400		38,026,854

TOTAL AND AVERAGES OF BOTH ENGINES TOGETHER FOR EACH YEAR.

1857	1,206	25	399,894	226,200	407,325	633,525	127,262,265	158.000		....
1858	1,154	55	446,724	232,050	430,225	662,275	142,155,434	156.533		31,453,325
1859	1,413	00	623,755	233,050	549,600	782,650	198,234,090	155.927		35,697,332
1860	1,811	05	818,303	298,750	707,950	966,700	260,220,354	156.466		35,206,903
1861	2,107	35	1,013,129	265,600	854,150	1,118,750	322,175,022	156.432		37,548,089
1862	2,347	05	1,162.494	276,846	1,115,127	1,391,978	369.673,092	156,357		34,720,024
1863	2,590	30	1,310,875	281,903	1,169,418	1,551,321	420,790,875	156,693		35,535,438
1864	2,848	10	1,483,225	274,744	1,445,568	1,720,392	476,114,225	157.313		36,410,146
1865	2,971	40	1,611,405	286,950	1,579,550	1,866,500	517,261,005	158.017		36,621,770
1866	3,321	85	1,829,820	276,800	1,925,400	2,202,200	587,372,220	157.731		35,304,587
1867	3,870	10	2,169,375	270,200	2,162,400	2,432,600	696,369,375	157.439		37,685,498
1868	4,503	13	2,394,975	198,100	2,078,600	2,276,700	768,786,975	157.822		44,364,421

SCHEDULE C.

Showing the Distribution of Water in Each Month in 1868.

Month.	Gallons Distributed.			
	Per month.	Average per day.	Ea. Inh. per day.	Ea.Co's'r per day.
January	57,555,300	1,856,622	21.84	102.32
February	61,720,275	2,128,285	25.04	117.35
March	60,981,975	1,967,160	23.14	108.42
April	54,754,575	1,825,152	21.47	100.59
May	58,157,175	1,876,038	22.07	103.39
June	62,142,390	2,071,413	24.37	114.16
July	85,670,085	2,763,551	32.51	152.31
August	74,311,500	2,397,145	28.20	132.11
September	63,862,950	2,128,765	25.03	117.29
October	64,689,525	2,086,759	24.55	115.01
November	57,780,000	1,926,000	26.66	106.17
December	67,161,225	2,166,491	25.48	119.40
Total and average	768,786,975	2,106,265	24.77	116.08

Totals and Averages for All Years Since Completion of Works.

Years.	Gallons Distributed.				Per Cent. of Increase.
	Per year.	Averago per day.	Ea. Inh. per day.	Ea.Co's'r per day.	
1857	127,262,265	348,664	7.75	110.68	....
1858	142,155,434	389,467	8.37	93.44	11.70
1859	198,234,090	513,107	11.31	91.27	39.45
1860	260,220,354	710,984	14.11	101.57	31.87
1861	322,175,022	881,599	16.32	114.50	23.81
1862	369,673,092	1,012,794	19.47	120.57	14.74
1863	420,790,875	1,152,851	20.97	117.54	12.83
1864	476,114,225	1,300,858	21.[illegible]	123.89	12.14
1865	517,261,005	1,417,153		[illegible].70	8.64
1866	587,372,220	1,[illegible]			13.55
1867	696,369,375	1,			8.55
1868	768,786,975	2,1			10.40

SCHEDULE D.

Showing Extension of Water Pipe in 1868.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
10	Superior . . .	East line Perry and W. line Dodge.	1,075	....	
10	Seneca ext. ..	16-inch main, south	30	....	
10	Scovill	West line Perry and Hayward......	2,630	....	
				3,735	
8	Centre	Merwin and Canal	936	....	
8	Centre	Main and West River	883	....	
8	Central Way.	T in Stone's levee, south........	157	....	
8	Central Way.	River pipe	220	....	Wrought i
8	Central Way.	Cuyahoga river to Railway street..	1,356	....	Cast iron.
8	Columbus . .	Pipe in Centre street, 31 ft. south..	31	....	
8	St. Clair . . .	Across Dodge street	60	....	
				3,643	
6	Carter	Seneca street pipe to W. line Seneca	30	....	
6	Case avenue .	Prospect street pipe, south	24	....	Put in s
6	Central Way.	30 ft. N. Eagle to X in Stone's levee	2,140		sprinkler
6	Circle	At State street, from pipe north....	18	....	
6	Cuyahoga . .	Central Way pipe to east line Central Way	29	....	
6	Dodge	St. Clair street pipe, north	125	....	
6	Franklin . . .	End of old pipe to 75 ft. W. Har....	450	....	
6	Garden	Perry street pipe to west line......	34	....	
6	Greenwood . .	Across Scovill	60	....	
6	Hudson	Across Scovill	60	....	
6	Laurel	Across Scovill	60	....	
6	Perry	Kinsman pipe to south line Cedar.	1,979	....	
6	Perry	St. Clair to Superior street pipe....	700	....	
6	Seneca ext. ..	16-inch main to Seneca bridge......	1,660	....	
				7,369	
4	Central Way.	Seneca pipe to Cuyahoga river	379	....	
4	French	Summer, east	177	....	
4	Front	South line River street, north to T.	35	....	
4	Front	South line Meadow north to 6 in. X.	35	....	
4	Huntington. .	Superior pipe to south line Superior	70	....	
4	Kennard . . .	Seneca pipe to west line Seneca....	24	....	
4	Mahoning . .	Central Way to east line Cent. Way	30	....	
4	Miami	Huron street pipe, south	208	....	
4	Ohio	Canal pipe to east line Canal	32	....	
4	Orange	Cross street pipe east	143	....	
4	Perry	To sprinkler southwest cor. Garden.	9	....	On east si
4	Pearl	North line Spruce, north	675		street.
4	Prospect . . .	From end of old pipe, east	120	....	
4	Summer . . .	Centre pipe to south line Centre....	31	....	
4	Summer . . .	End of old pipe to French	84	....	
4	Vaillant . . .	Seneca pipe to west line Seneca....	24	....	
				2,076	
3	Case avenue .	Fire hyd. southwest cor. Prospect..	30	....	
3	Centre	Fire hyd. northwest cor. First......	21	....	
3	Central Way.	Fire hyd. northeast cor. Cuyahoga..	16	....	
3	Central Way.	Fire hyd. E. side 434 ft. S. Cuyahoga	19	....	
3	Central Way.	Fire hyd. W. S. 200 ft. N. Com'l....	26	....	
3	Central Way.	Fire hyd. E. S. 210 ft. N. Harrison..	21	....	

SCHEDULE D—Continued.

Showing Extension of Water Pipe in 1868.

Diameter of Pipes in inches.	In What Street.	Between What Streets.	Feet Laid.	Total.	Remarks.
3	Central Way.	Fire hyd. W. S. 57 ft. S. Ohio	29	....	
3	Central Way.	Fire hyd. S. E. corner Eagle	17	....	
3	Central Way.	Fire hyd. near the bridge	24	....	
3	Dodge	Fire hyd. N. W. cor. St. Clair	13	....	
3	Eagle	Fire hyd. S. E. corner Canal	23	....	
3	Franklin . . .	Fire hyd. S. W. corner Harbor	23	....	
3	Literary . . .	Fire hyd. E. S. 66 ft. S. Mahoning..	19	....	
3	Literary . . .	Fire hyd. E. side, end of pipe	12	....	
3	Mulberry . . .	670 ft. N. of Spruce W. Side..........	13	....	
3	Ohio	Fire hyd. S. E. corner Canal	23	....	
3	Perry	Fire hyd. S. E. corner Garden	15	....	
3	Perry	Fire hyd. N. E. corner Scovill	15	....	
3	Perry	Fire hyd. bet Scovill and Kinsman..	21	....	
3	Scovill	Fire hyd. opposite Chapel	22	....	North side.
3	Scovill	Fire hyd. S. W. corner Charles	13	....	
3	Scovill	Fire hyd. 131 ft. E. of Maple	24	....	
3	Scovill	Cistern connection at Laurel	8	....	
3	Seneca ext. ..	Fire hyd. N. W. corner Girard	22	....	
3	Seneca ext. ..	Fire hyd. N. W. corner Vaillant....	15	....	
3	Seneca ext. ..	Fire hyd. N. W. corner Carter......	14	....	
3	St. Clair . . .	Fire hyd. New Market House......	35	....	
3	Superior . . .	Fire hyd. S. W. corner Perry	41	....	
3	Superior . . .	Fire hyd. near Huntington	31	....	
3	Willson av. ..	Cistern north of Kinsman	63	668	
				17,491	

SCHEDULE D—Continued.

Pipes Taken Up and Lines Relaid.

Taken up Diam. in.	Laid in Place Diam. in.	Street.	Between What Streets.	Length Feet.	Total.
8	10	Seneca Ex.	16-inch Main pipe south..	6	......
8	8	Centre	Maine and West River....	883	......
8	8	St. Clair	Across Dodge	60	......
					949
4	8	Centre	Merwin and Ohio Canal..	936	......
4	8	Columbus	Pipe in Centre 31 ft. south	31	......
4	10	Scovill	Across Perry street	60	......
4	6	Dodge	St. Clair st. pipe north..	125	......
4	6	Perry	Kinsman pipe to south line Cedar	1,979	......
4	6	Perry	St. Clair st. pipe south...	45	......
					3,176
3	3	Centre	Fire hydrant northwest corner First	21	......
3	3	Dodge	Fire hydrant northwest corner St. Clair	42	......
3	3	Perry	Fire hydrant S. E. corner Garden	15	......
3	3	Perry	Fire hydrant N. E. corner Scovill	18	......
3	3	Perry	Fire hydrant bet. Kinsman and Scovill	21	......
3	3	St. Clair	Fire Hydrant at New Market House	33	......
					150
					4,275

PIPES LAID TO DECEMBER 31, 1868.

	24	20	16	10	8	6	4	3	2
Previous to 1868	2,668	10,913	12,454	11,772	14,457.5	36,168.75	99,606.25	6,213	8,175
Laid in 1868	.....	......	......	3,735	3,643.0	7,369.00	2,076.00	668	.....
Taken up in 1868	.....	......	......	......	949.0	....	3,176.00	150	.....
	2,668	10,913	12,454	15,507	17,151.5	43,537.75	98,506.25	6,721	8,175
	26,035 feet.			182,241 feet.					

26,035 feet, or 4,931 miles of supply main, and
182,241 feet, or 34,515 miles of distributing pipes.

208,276 feet, or 39.446 miles in all.

SCHEDULE E.

Giving Size, Number and Location of Stop Gates in the Streets in 1868.

Number.	Waterway in inches.	LOCATION.	
		Street.	Side of Street.
1	10	Seneca extension	South side of Girard.
1	10	Superior	East side of Perry.
1	10	Superior	West side of Perry.
1	10	Scovill avenue	West side of Perry.
1	10	Scovill avenue	East side of Perry.
1	10	Scovill avenue	West side of Henry.
1	10	Scovill avenue	West side of Hayward.
1	10	Scovill avenue	West side of Laurel.
8	10	inch gates.	
1	8	Central Way	46 feet S. of Woolson's line and 18 feet W. of E. line of street.
1	8	Central Way	92 feet north of Cuyahoga.
1	8	Central Way	North side of Mahoning.
1	8	Central Way	At end of pipe in Literary.
1	8	Center	East side of Merwin.
1	8	Center	West side of Columbus.
1	8	Center	Between main and 6-inch pipe in Detroit street.
1	8	Columbus	South side of Center.
1	8	South Water	South side of West.
9	8	inch gates.	
1	6	Carter	West side of Seneca.
1	6	Central Way	South side of Eagle.
1	6	Central Way	South side of Ohio.
1	6	Central Way	North side of Harrison.
1	6	Cuyahoga	East side of Central Way.
1	6	Dodge	North side of St. Clair.
1	6	Franklin	West side of Harbor.
1	6	Garden	West side of Perry.
1	6	Greenwood	North side of Scovill avenue.
1	6	Greenwood	South side of Scovill avenue.
1	6	Hudson	North side of Scovill avenue.
1	6	Hudson	South side of Scovill avenue.
1	6	Laurel	North side of Scovill avenue.
1	6	Laurel	South side of Scovill avenue.
1	6	Perry	South side of St. Clair.
1	6	Perry	North side of Superior.
1	6	Perry	South side of Garden.
1	6	Perry	North side of Scovill avenue.
1	6	Perry	North side of Kinsman.
1	6	Seneca extension	North side of Girard.
20	6	inch gates.	
1	4	Central Way	East side of Seneca.
1	4	French	East side of Summer.

SCHEDULE E—Continued.

1	4	Huntington	South side of Superior.
1	4	Kennard	West side of Seneca.
1	4	Mahoning	East side of Central Way.
1	4	Miami	South side of Huron.
1	4	Ohio	East side of Canal.
1	4	Orange	East side of Cross.
1	4	Summer	South side of Center.
1	4	Vaillant	West side of Seneca.
1	4	Willson	East side of Clinton Park.
11	4	inch gates.	
1	3	Laurel	Cistern connection.
1	3	Willson avenue	Cistern connection at Kinsman.
2	3	inch gates.	
1	2	Case avenue.	Corner Kinsman.
1	2	Bank	North end of street.
1	2	Franklin	Circle at State street.
1	2	Hudson	Southeast corner Scovill avenue.
4	2	inch gates.	

RECAPITULATION.

8	10	inch stop-gates.	29	3	inch stop-gates for Fire Department.
9	8	inch stop-gates.	4	2	inch stop-gates for street sprinklers.
20	6	inch stop-gates.			
11	4	inch stop-gates.			
48	......	in all for st. use.	33	....	81 total for all purposes.

II. TABLE SHOWING NUMBER OF STOP-GATES SET IN THE STREETS TO DECEMBER 31st, 1867.

Water way in inches.....	24	20	16	10	8	6	4	3	2	Total.
Previous to 1868	2	12	16	14	29	74	253	71	3	474
Set in 1868	.....	.....	.....	8	9	20	11	29	4	81
Taken up in 1868	.....	.....	.....	.....	1	.....	9	.....	.....	10
Total	2	12	16	22	37	94	255	100	7	545

SCHEDULE F.

Giving Number and Location of Fire Hydrants Set in 1868.

No.	STREET.	BETWEEN	SIDE OF ST.
1	Bank	N. W. corner Lake	
1	Central Way.	At Forge	
1	Central Way.	Eagle	East.
1	Central Way.	Ohio	West.
1	Central Way.	Opposite cooper shop	West.
1	Central Way.	Opposite Woolson's foundry	West.
1	Central Way.	Cuyahoga	East.
1	Central Way.	Cuyahoga and Mahoning	East.
1	Central Way.	Mahoning street and R R	East.
1	Central Way.	Literary	East.
1	Canal	Eagle	East.
1	Canal	Ohio	East.
1	Case avenue	Prospect	West.
1	Franklin	Harbor	South.
1	Mulberry	Near Pearl	West.
1	Mulberry	At Gas Works	
1	Superior	Perry	South.
1	Superior	Near Huntington	North.
1	Scovill	Opposite Chapel	
1	Scovill	Corner of Charles	
1	Scovill	Linden and Haywood	North.
1	Seneca ext.	Girard	West.
1	Seneca ext.	Vaillant	West.
1	Seneca ext.	Carter	West.
1	St. Clair	Near Market House	North.
1	Center	Columbus, Lowrie hydrant	
1	Superior	Water, Lowrie hydrant	

27	new fire hydrants set in 1868.
208	fire hydrants set previous to 1868.
235	Total number now in use.

REPORT

OF

Secretary of Water Works.

Water Works Office,
Cleveland, January 1, 1869.

To the Trustees of the Water Works:

Gentlemen:—The following is an abstract of the cash account of the receipts and expenditures of the Water Works for the year 1868:

RECEIPTS.

For water	$ 57,691 02		
Less amount refunded	393 04		
		$57,297 98	
From city, to pay int. on Water Bonds		38,000 00	
From city, to lay water pipe		11,856 42	
			$107,154 40
Cash in Treasury, January, 1868			215 10
			$107,369 50

EXPENDITURES.

For running expenses	$ 17,304 32	
For repairs	3,653 43	
For pipe extension	33,189 20	
For interest on temporary loans	32 66	
For am't forwarded Ocean Bank to pay interest	37,100 00	
For amount forwarded Ocean Bank as deposit	900 00	
For inlet extension—preliminary expenses	929 67	
		93.109 28
Cash in Treasury January 1, 1869		2

There are no outstanding liabilities of the W
except the bonded debt.

The following table exhibits the aggregate yearl
for water, and the expenditures for running expenses
pairs, from the time of the introduction of lake water
city, until the present date, also the earnings after deduc
expenditures.

Years.	Receipts for water less amount refunded.	Running Expenses.	Repairs.	Receipts less running expenses and repairs.
1856 to 1859 inclusive	$34,528 73	$29,845 49	$2,996 08	$ 1,687 16
1860	16,793 60	7,683 80	1,734 38	7,375 42
1861	17,097 85	7,768 36	1,350 84	7,978 65
1862	22,730 53	8,086 19	1,291 29	13,353 05
1863	23,421 30	10,011 96	835 54	12,573 80
1864	33,389 49	13,573 26	1,953 49	17,862 74
1855	40,888 01	17,346 56	1,382 21	22,159 24
1866	45,363 70	14,277 13	8,818 77	22,267 80
1867	51,862 45	14,246 06	3,685 79	33,930 60
1868	57,297 98	17,304 32	3,653 43	36,340 23

By reference to this table, the comparative receipts, expenditures, and the earnings for the several years, can be readily perceived.

Respectfully submitted,

H. C. HAWKINS,
Secretary.

OCT 12 '98
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FOURTEENTH ANNUAL REPORT

OF THE

Board of Trustees of Water Works,

TO THE

COUNCIL OF THE CITY OF CLEVELAND,

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD,

FOR THE YEAR 1869.

CLEVELAND:
PRINTED AT THE LEADER BOOK AND JOB OFFICE, 144 SUPE[illegible]T,
1870.

14

FOURTEENTH ANNUAL REPORT

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TILDEN FOUNDATIONS.
1909

ANNUAL REPORT

OF THE

TRUSTEES OF THE WATER WORKS.

WATER WORKS OFFICE,
CLEVELAND, January 1, 1870.

To the Honorable City Council:

GENTLEMEN,—The undersigned herewith submit the Fourteenth Annual Report of the Superintendent and Engineer of the Water Works; also, the report of the Secretary, which reports so fully show the condition of the works and finances of this Department that anything further from us seems unnecessary.

We, therefore, respectfully refer you to the accompanying reports for details.

E. M. PECK,
WILLIAM BINGHAM,
JOHN H. SARGEANT,
TRUSTEES.

BOARD OF TRUSTEES OF WATER WORKS.

1853.

RICHARD HILLIARD, President.
HENRY B. PAYNE, BASIL L. SPANGLER.

1854.

RICHARD HILLIARD, President.
HENRY B. PAYNE, BASIL L. SPANGLER.

1855.

RICHARD HILLIARD, President.
HENRY B. PAYNE, CHARLES L. RHODES.

1856.

RICHARD HILLIARD, President.
HENRY B. PAYNE, CHARLES L. RHODES, DAVID H. BEARDSLEY.*

1857.

HENRY B. PAYNE, President.
WILLIAM F. OTIS, CHAS. L. RHODES, ETHAN ROGERS.†

1858.

HENRY B. PAYNE, President.
WILLIAM F. OTIS, SAMUEL F. LESTER.

1859.

WILLIAM F. OTIS, President.
SAMUEL F. LESTER, WILLIAM B. CASTLE.

1860.

SAMUEL F. LESTER, President.
WILLIAM B. CASTLE, PETER THATCHER.

1861.

SAMUEL F. LESTER, President.
WILLIAM B. CASTLE, PETER THATCHER.

1862.

LEANDER M. HUBBY, President.
SAMUEL F. LESTER, PETER THATCHER.

1863.

LEANDER M. HUBBY, President.
SAMUEL F. LESTER, PETER THATCHER.

1864.

LEANDER M. HUBBY, President.
WILLIAM B CASTLE, PETER THATCHER.

Appointed to fill vacancy caused by death of Richard Hilliard.
Appointed to fill vacancy caused by resignation of Charles L. Rhodes.

1865.

PETER THATCHER, President.
WILLIAM B. CASTLE, WILLIAM BINGHAM.

1866.

WILLIAM B. CASTLE, President.
WILLIAM BINGHAM, JOHN F. WARNER.

1867.

WILLIAM BINGHAM, President.
JOHN F. WARNER, E. M. PECK.

1868.

WILLIAM BINGHAM, President.
JOHN F. WARNER, E. M. PECK.

1869.

E. M. PECK, President.
WILLIAM BINGHAM, JOHN H. SARGENT.

OFFICERS AND EMPLOYEES OF THE WATER WORKS

FOR THE YEAR 1869.

BOARD OF TRUSTEES.

E. M. PECK, President.
WILLIAM BINGHAM, JOHN H. SARGEANT.

SUPERINTENDENT AND ENGINEER,
JOHN WHITELAW.

SECRETARY,
H. C. HAWKINS.

ENGINEER AT PUMPING WORKS,
JOHN VIAL.

ASSISTANT SUPERINTENDENT,
ALFRED GAYTON.

SUPERINTENDENT OF EXTENSION AND REPAIRS,
P. K. MONKS.

STREET FOREMAN,
JAMES CURRY.

RESERVOIR KEEPER,
FRED IMELMAN.

TAPPERS,
JOHN GLEESON, PETER SCHMI

FOURTEENTH ANNUAL REPORT

OF THE

Superintendent and Engineer

OF THE

CLEVELAND WATER WORKS.

To the Board of Trustees of Water Works:

GENTLEMEN: I herewith submit for your consideration the Fourteenth Annual Report upon the condition of the Cleveland Water Works.

INLET PIPE AND AQUEDUCT.

During the past year no repairs have been required upon these parts of the works, but during the coming season the aqueduct should be cleaned out, and in order that the work may be done in an economical and expeditious manner, I would recommend that a steam pump, capable of throwing sand or mud, be purchased for such purpose.

It will be remembered that when the aqueduct was cleaned in 1866, that the work was very much delayed in consequence of not having a suitable pump for removing the water and sediment, and that the cost of repairing the pump used and the price paid for the use of it, was more than would have purchased a pump in every way better adapted to do the work.

TUNNEL.

The surveys and preliminary examinations for the Lake Tunnel having been completed early in the season, and the result of the examinations being so favorable, it was believed by all the officers of the works, that if the sinking of the shore shaft could be accomplished by themselves before contracting for the balance of the work, that the cost of the whole work might be materially reduced.

With this object in view, permission was asked of the City Council to allow the Water Works Board to build that part of the work without advertising for proposals, which permission was granted, and the work was commenced on the 23d day of August, under an agreement with Mr. Albert G. Smith to furnish all the labor, tools and machinery for building the shaft and twenty feet of tunnel for the sum of two thousand six hundred dollars, and for any curbing that it might be found necessary to use, the sum of thirty dollars per thousand feet, and for building a chamber and passage way to it inland from the shaft, the sum of three dollars per cubic yard for excavation, and eight dollars per thousand for the brick laid in lining the same. The Water Works Board agreeing to furnish the cast iron cylinders, brick and cement. On the 31st day of December the work was completed in a satisfactory manner, and Mr. Smith directed to continue at work at the tunnel until the contract is awarded for the whole work. In order that the work may be pushed forward as rapidly as possible after the contract is awarded, the timber for the protection crib has been purchased and is now all on hand, stored in a convenient location near the old river bed.

A contract has also been made with the Cuyahoga Steam Furnace Company for making the cast iron cylinders for the inlet shaft, and they will probably all be ready before the crib is completed.

The expense incurred for the different parts of the work, for the year ending December 31st, 1869, is shown in the following pages in detail.

ENGINE HOUSE AND LOT.

The following report submitted to you by the e
charge of engines, gives a clear statement of the

the engines, with the repairs and improvements made during the year, and is as follows:

WATER WORKS ENGINE HOUSE,
July 1st, 1870.

To the Board of Water Works Trustees:

GENTLEMEN:—In accordance with my duty I herewith submit a report upon the condition of the pumping machinery, with the amount of work done, and the repairs and improvements made during the past year.

The east engine was stopped on two different occasions, first on the 8th day of March, on account of fracturing a shaft in the air pump connections, and again on the 29th day of August, at 11:15 P. M., by the breaking of the pumping main about four hundred feet from the engine house.

There has been an uninterrupted supply of water throughout the year, the average depth in the reservoir having been 18 3-10 feet.

The engines worked during the year 365 days, the average running time per day being fifteen hours and thirty-two minutes, an increase of forty-five days, and a per diem increase of one hour and twenty minutes.

Number of strokes made by east engine	1,311,025
Number of strokes made by west engine	1,489,400
Total number of strokes	2,800,425

Average height above surface of lake to which the water was raised, 157 51-100.

Duty of east engine	45,641,403
Duty of west engine	43,699,993

pounds of water raised one foot high with each hundred pounds of coal consumed.

The following are the repairs and improvements made during the year:

Put a new shaft in the air pump connections of east engine.

Re-set clamps on lower main pump chamber of west engine, and put on three additional new clamps.

Repaired the exhaust valve and valve rod of east engine.

Overhauled and refitted the journals and brasses of the beam ends, main links of both engines.

A blank flange or hood for the main discharge pipe branch has been made and is on hand ready for use when it becomes necessary to put the new stop valve and lower pump valve chamber in place.

Eye bolts have been placed in the ceiling of the upper room over the main journals.

Hand lever attachments have been fitted to the flue dampers of both sets of boilers.

It was thought best to defer the placing of the small cast iron doors in the front walls of the boilers until next season, when the walls and fire door fronts will have to be repaired and a portion of them rebuilt; the doors can then be permanently placed in the walls without any additional expense.

A new cast iron foot piece, with screw and screw lever, has been made for raising the pump valve above their seats while working repairs.

New hand rails have been erected around the openings in the upper floor, at the pump ends of the main beams; this improvement was much needed to prevent accidents to those in attendance upon the beam and journals when the engines are working.

The apparent condition of the fractured valve chambers of the main pumps is much the same as during last year.

The new stop valve chamber and pipes that were ordered at the Globe Iron Works for the main pump of the west engine, are completed and are ready to be put in place at any time.

The engines and boilers are in good working condition. The boilers have not needed any repairs for the past year.

I would respectfully call your attention to the following much needed repairs and improvements :

1st. To the bad condition of the smoke pipe. I would recommend that about forty feet of the upper part of it be removed as soon as convenient, the remaining portion of it would be high enough to give the regular draft, and is in good repair.

2d. The cold water cisterns of both engines are in a bad state of repair; they are constructed of oak plank which is beginning to decay. I would recommend that they be renewed at an early day.

The annexed schedule A, gives the engine records for the year 1869.

All of which is respectfully submitted.

JOHN VIAL,

Engineer in Charge.

It will be seen by referring to the engine record for the last year, that the duty of the engines has been maintained, the average for both engines being a little in excess of the average for the preceding year.

The tin roof of the engine room and tower has been thoroughly repaired, and together with the outside wood-work of the whole engine house has received two coats of iron ore paint.

The roofs of the boiler rooms have been renewed with slate.

The annexed tables give the engine record for the past year, the aggregate for both engines for each year since they were put in operation; the monthly and daily averages of the consumption for the year 1869, and the totals and averages for each year to January 1st, 1870.

RESERVOIR AND GROUNDS.

The condition of the reservoir and grounds is about the same as at the date of my last report, no repairs having been necessary.

The turf is all in good condition and has been covered wherever the grass was thin with the compost prepared last season.

The basins will be cleaned out and such repairs as may be necessary, will be made to the brick lining of the reservoir early in the spring.

DISTRIBUTION.

The monthly and total consumption of water for the year the consumption for each year since the completion of the works, the daily average for each consumer, and each inhabitant, and the annual ratio of increase since the completion of the works is given in schedule "C."

The sizes and length of the different sizes of pipe laid during the year, the streets in which they are laid, together with the total length of the different sizes laid to the 1st of January, 1870, are shown in schedule "D."

The location, size and number of stop valves set in the streets during the year 1869, with the number and size of all set previous to that year is given in schedule "E."

The number of new fire hydrants set and connected with the water pipes, and their position in the streets, is given in schedule "F."

The number and size of the new service pipe connections made with the distributing mains during the year is as follows:

4 inch	connections	1
3	"	1
2	"	5
1	"	3
¾	"	7
⅜	"	618
Total		635

The total number of connections made with the distributing mains to January 1st, 1870, was 3,227. The number of each size was as follows:

4 inch	connections	6
3	"	8
2	"	29
1½	"	11
1	"	82
¾	"	207
⅜	"	2,884
Total		3,227

The number of service pipes in actual use is about 2,800, the others being laid only to the line of the sidewalks, and in streets that have recently been paved.

GENERAL REMARKS.

The expenditure for the year as shown by [illegible] s office have been as follows:

RUNNING EXPENSES.

Pay roll for twelve months	$13,241 07
Coal for engines	3,500 77
Hauling same from dock	346 96
Coal for office	52 00
Printing and stationery	199 45
Oil	272 27
Packing	75 36
Mutton tallow	148 16
Brass work	505 11
Soap	16 00
Plumbing	48 00
Exchange, postage and revenue stamps	33 45
Rent of store room	150 00
Hardware	81 53
Lumber and carpenter work	10 00
Grass seed	3 25
Compost for reservoir lot	120 00
White and red lead, and barrel oil	41 57
Six chairs for office	12 00
Small stores	28 79
Hauling	10 97
Travelling	79 30
	$18,976 01
Received for sundries	95 88
Nett expenditure—running expenses	$18,880 13

REPAIRS FOR 1869.

Pay roll for twelve months	$2,030 48
Team work and express	143 51
Blacksmithing	484 53
Painting engine house and tower	300 00
Slate roof on boiler rooms	476 88
Paving	172 27
Plumbing	61 97
Castings	47 85
Fire clay, brick and mason work	43 50
Enameled cloth	15 30
White lead	14 38
Lumber and carpenter work	11 09
Hardware	14 24
Twine	9 93
Pig lead	8 80
Printing	5 00
Coal	5 00
Small stores	6 90
	$3,851 63
Received for sundries	552 07
Nett expenditure—repairs	$3,299 56

PIPE EXTENSION, 1869.

Pay roll for twelve months	$10,408 63
Iron pipe	45,609 98
Pig lead	4,250 64
Castings	3,703 62
Valves	2,511 00
Hauling	1,017 04
Blacksmithing	313 51

PIPE EXTENSION—Continued.

Plumbing	447 28
Brass work	245 65
Meters	325 00
Hemp packing	165 44
Coal	106 00
Wood plugs	60 91
Lumber and carpenter work	50 75
Brick and mason work	46 60
Paving	82 70
Fire clay	13 11
Hardware	23 64
Printing	19 50
Traveling expenses	40 75
Freight	13 29
Revenue stamps	2 50
Small stores	5 75
	$69,463 29
Less cash received for sundries	2,132 58
Nett expenditure—pipe extension	$67,330 71

INLET EXTENSION.

Pay roll for twelve months	$307 82
Use of tug boats and lighter	447 00
Engineering	2,625 00
Traveling expenses	79 30
Anchors	25 60
Hauling	11 25
Hardware	17 83
Lumber and carpenter work	22 14
Blacksmithing	19 95
Gas pipe	90 21
Printing	54 00
Sundry expenses	182 00
	$3,912 10
Expended in 1868	929 67
Total	$4,841 77

CRIB.

Pay rolls—docking timber	$985 75
Timber for crib	14,302 80
Rent of lot and dock	180 00
Printing	20 00
Trucks and handspikes	4 50
	$15,493 05

LAKE SHORE SHAFT.

Four cast-iron cylinders	$3,312 87
Delivering same on lake shore	72 18
Paid A. G. Smith for labor	2,227 01
" " " brick	541 20
" " " lumber	159 52
Cement	207 10
Freight on Cement	56 02
Hauling same to shaft	17 05
Paid Inspector	63 50
	$6,656 45

The principal lines of pipe to be laid during the season will be those ordered by the City Council last year, to be laid in the following streets, viz: Superior street, between Perry street and Case avenue; Lorain street, between Orchard and Courtland street, and in Scranton avenue, Fairfield and Literary streets; from the sixteen inch main in Girard street to the Mahoning railroad crossing at Literary street.

The estimated cost of other lines to be laid during this year is $30,000.

The total cost of the Water Works to December 31st, 1869, is as follows:

Cost of construction to Dec. 31st, 1858			$518,731 88
" " and pipe extension to Dec. 31st,		1859	25,098 05
" " " " " "		1860	4,108 72
" " " " " "		1861	3,727 87
" " " " " "		1862	3,647 02
" " " " " "		1863	7,964 34
" " " " " "		1864	27,011 21
" " " " " "		1865	29,090 59
" " " " " "		1866	34,844 72
" " " " " "		1867	36,008 30
" " " " " "		1868	32,040 63
" pipe extension	$67,330 71	1869	94,321 98
Expended for tunnel, &c	26,991 27		
Total cost of works Dec. 31st, 1869			$816,595 31

The earnings of the works for the last year were $40,690.03 over running expenses and repairs, amounting to nearly five per cent. of the entire cost of the Water Works to December 31st, 1869.

Deducting the amount expended upon the tunnel, the increase is about one-half of one per cent. for 1869.

Respectfully submitted,

JOHN WHITELAW,

Superintendent and Engineer.

SCHEDULE A.

ENGINE RECORDS FOR 1869.

EAST ENGINE.

MONTHS.	D'S.	PUMP'G		STROK'S	COAL CONSUMED FOR			Gallons water pumped.	Hight	DUTY.
		hrs.	m.		Ras'g ste'm	Pumping.	Total.		ft.|de.	
January...	14	169	20	84,000	2,400	66,800	69,200	26,964,000	158,458	51,635,831
February	14	179	35	87,150	2,400	68,000	70,400	27,975,150	158,327	52,615,654
March......	11	151	15	73,825	4,800	72,800	77,600	23,697,825	158,346	40,438,896
April.........	18	233	20	112,725	5,600	104,800	110,400	36,184,725	157,717	43,230,748
May.........	17	246	50	117,125	2,400	113,000	115,400	37,597,125	157,181	42,825,392
June.........	13	203	20	99,325	2,400	84,400	86,800	31,883,325	156,807	48,159,439
July.........	17	279	00	138,775	2,400	120,400	122,800	44,546,775	156,470	47,466,845
August	15	254	45	132,200	2,400	116,200	118,600	42,436,200	156,707	46,892,368
Septemb'r	14	248	30	126,175	3,200	110,600	113,800	40,502,175	156,910	46,704,459
October....	14	244	20	118,950	2,400	101,600	104,000	38,182.950	157,511	48,361,775
Novem'r..	15	257	40	117,725	3,200	111,200	114,400	37,789,725	157,999	43,646,841
December	14	221	30	103,050	2,800	108,200	111,000	33,079,050	157,505	39,252,359
T'ls & av's	176	2689	25	1,311,025	36,400	1,178,000	1,214,400	420,839,025	157,495	45,641,403

WEST ENGINE.

January...	16	212	40	102,425	3,000	90,800	93,800	32,878 425	158,348	46,417,216
February	14	194	15	92,650	2,600	83,200	85,800	29,740,650	158,243	45,869,584
March......	21	301	25	145,025	2 400	146,400	148,800	46,553,025	158,349	41,429,466
April.........	12	179	30	86,375	2,400	83,400	85.800	27,726,375	157,701	42 616,003
May.........	14	213	30	100,125	4,800	98,400	103,200	32,140.125	157,255	40,956,999
June.........	17	278	15	135,225	2,400	125,600	128,000	43,407,225	156 921	44,508.556
July.........	14	235	40	118,750	2,400	111,800	114,200	38,118,750	156,529	43,692,479
August.....	16	278	35	151,125	3,400	127.800	131,200	48,511,125	156,749	48,468,154
Sept'mb'r	16	284	20	152,550	2,400	142,800	145,200	48,968,550	157,114	44,309,905
October....	17	292	45	154,675	2,400	140,400	142,800	49,650,675	157,789	45,880,322
Novem'r..	15	244	20	119,275	3,000	119,400	122,400	38,287,275	157,788	41,276,451
December	17	268	25	131,200	2,400	137,000	139,400	42,115,200	157,499	39,791,938
T'ls & av's	189	2983	35	1,489,400	33,600	1.407,000	1,440,600	478,097,400	157,523	43,699,993

BOTH ENGINES.

T'ls & av's	365	5673	00	2 800,425	70,000	2,585,000	2,655,000	898,936,425	157,509	44,597,144

SCHEDULE B.

AVERAGE ENGINE RECORDS FOR ALL YEARS SINCE THE COMPLETION OF WORKS.

EAST ENGINE.

YEARS.	PUMP'G.		Strokes.	COAL CONSUMED BY			Gallons water pumped.	HIGHT	DUTY.
	hrs.	m.		Rais'g steam.	Pumping.	Total.		ft. dec.	
1857.........	693	35	231,354	118,850	235,225	354,075	74,626,095	158.000	29,604,192
1858.........	524	15	197,456	107,850	190,725	298,575	62,847,939	156.633	31,202,484
1859.........	668	15	300,064	111,750	262,050	373,800	95,420,352	158.896	35,329,535
1860.........	999	20	453,318	142,600	377,050	519,650	144,154,124	156.499	36,276,689
1861.........	1,066	45	509,785	131,550	415,900	547,450	162,111,630	156.424	38,690,736
1862.........	1,224	15	603,407	142,206	572,693	714,899	191,883,426	156.410	35,102,083
1863.........	1,187	35	605,475	132,788	559,500	692,288	194,357,475	156.693	36,788,845
1864.........	1,269	50	681,800	126,456	643,068	769,524	228,857,800	157.348	37,424,474
1865.........	1,507	00	835,535	147,600	799,400	947,000	268,203,525	158.084	37,441,769
1866.........	1,650	05	902,175	....	....	1,071,600	289,598,175	157.634	35,625,991
1867.........	1,541	05	835,875	110,500	843,900	954,400	268,315,875	157.478	37,022,693
1868.........	2,444	28	1,273,625	98,900	1,100,100	1,199,000	408,833,625	157.866	45,021,292
1869.........	2,689	25	1,311,025	36,400	1,178,000	1,214,400	420,839,025	157.495	45,641,408

WEST ENGINE.

1857.........	512	50	168,540	107,350	172,100	279.450	53,636,170	158.000	28,321,942
1858.........	630	40	249,238	124,200	239,500	363,700	79,307,495	156.533	31,704,166
1859.........	744	45	323.691	121,300	287,550	408,850	102,813,738	155 958	36,065.129
1860.........	811	45	364 985	116,150	330,900	447,050	116 066,230	156.434	34,137,118
1861.........	1,040	50	503,344	133,050	438,250	571,300	160,063,392	156 440	36,405,441
1862.........	1,122	50	559,087	134,640	542,434	677,074	177,789,666	156.304	34,317,546
1863.........	1,402	55	705,400	149,115	709,918	859,033	226,433,400	156.694	34,541,163
1864.........	1,578	20	801,425	148,288	802,500	950,788	257,256,425	157.278	35,588,054
1865.........	1,464	40	775.880	139,350	780,150	919,500	249,057,480	157.950	35,778 436
1866.........	1,671	30	927,645	148,500	982,100	130,600	297,774,045	157.829	34,763,110
1867.........	2,329	05	1,383,500	159,700	1,318,500	1,478,200	428,053,500	157.400	38,026,854
1868.........	2,058	45	1 121,350	99 200	978,500	1,077,700	359,953,350	157.778	44,072,868
1869.........	2.983	35	1,489.400	33,600	1,407,000	1.440,600	478,097,400	157.523	43.699,993

TOTALS AND AVERAGES OF BOTH ENGINES TOGETHER FOR EACH YEAR.

1857.........	1,206	25	399,894	226,200	407,325	633,525	127 262,265	158.000	....
1858.........	1,151	55	446,724	232,050	430,225	662,275	142,155,434	156.533	31,453,325
1859.........	1,413	00	624,735	233,050	549,600	782,650	198,234,090	155.927	35,697,332
1860.........	1,811	05	818,303	298,750	707,950	966.700	260,220 354	156.466	35,206,908
1861.........	2,107	35	1,013,129	265,600	854,150	1,118,750	322,175,022	156.432	37,548,089
1862.........	2.347	05	1,162,494	276,846	1,115,127	1,391,978	369,673,092	156.357	34 720,024
1863.........	2,590	30	1,310,875	281,903	1,169,418	1,551.321	420,790,875	156.693	35,535,438
1864.........	2 848	10	1.483,225	274,744	1 445 568	1,720,392	476,114,225	157.313	36,410,146
1865.........	2,971	40	1,611,405	286,950	1,579 550	1,866 500	517,261,005	158.017	36.621,770
1866.........	3,321	85	1,829,870	276,800	1,925,400	2,202,200	587,372,220	157.731	35,304,587
1867.........	3,870	10	2,169.375	270,200	2,162,400	2 432.600	696 369,375	157.439	37,685,498
1868.........	4,503	13	2,394,975	198,100	2,078.600	2,276,700	768,786,975	157.822	44,364,421
1869.........	5,673	00	2,800,425	70.000	2,585,000	2,655,000	898,938,425	157.509	44,597 144

SCHEDULE C.

SHOWING THE DISTRIBUTION OF WATER IN EACH MONTH IN 1869.

MONTH.	GALLONS DISTRIBUTED.			
	Per month.	Average per day.	Ea. inh. per day.	Ea. con'r per day.
January	59,842,425	1,930,490	21,45	98,49
February	57,715,800	2,061,278	22,90	105,16
March	70.250,850	2,266,156	25,18	115,62
April	63,911,100	2,130,370	23.67	108,73
May	69,737,250	2,249,588	24,99	114,77
June	75,290,550	2,509,685	27,88	128,04
July	82,665,525	2,666,565	29,62	136,05
August	90,947,325	2,933,784	32,60	143,63
September	89,470,725	2,982,357	33,11	152,16
October	87,833,625	2,833,343	31,15	144,55
November	76,077,000	2,535,900	28,17	129,38
December	75,194,250	2,425,621	26,95	123,75
Total and average	898,936,425	2 462,839	27,36	125,65

TOTALS AND AVERAGES FOR ALL YEARS SINCE COMPLETION OF WORKS.

YEARS.	GALLONS DISTRIBUTED.				PER CENT. OF INCRE'SE
	Per year.	Average per day.	Ea. inh. per day.	Ea. con'r per day.	
1857	127,262,265	348,664	7,75	110,68	
1858	142,155,434	389,467	8,37	93,44	11,70
1859	198,234,090	513.107	11,31	91,27	39,45
1860	260,220,354	710,984	14,11	101,57	31,87
1861	322,175,022	881,599	16,32	114 50	23.81
1862	369,673,092	1,012,794	19,47	120,57	14,74
1863	420,790,875	1,152,851	20,97	117,54	12,83
1864	476,114,225	1,300,858	21,68	123,89	12,14
1865	517 261,005	1,417,153	21,80	123,70	8,64
1866	587,372 220	1,609,239	22,35	124,26	13,55
1867	696,369 375	1,907,861	23,85	115,98	18,55
1868	768,786,975	2,106,265	24,77	116,08	10 40
1869	898,936,425	2 462,839	27.36	120,20	16 92

SCHEDULE D.

SHOWING EXTENSION OF WATER PIPE IN 1869.

DIAM. PIPE INCH'S.	WHAT STREET	BETWEEN WHAT STREETS.	FEET PIPE LAID	TOTAL.	REMARKS.
16	Ohio	At Broadway		36	
12	Fulton	At Lorain		35	
10	Broadway	Ohio to Cross	1,100		
10	Erie	Superior to St. Clair	800		
10	Lorain	Fulton street westerly	1,130		
10	Scovill	Perry to Burnham	800		
10	"	Hayward to Case avenue	2,023		
10	Wilson av	Woodland avenue pipe north	65		
				5,918	
8	Broadway	Cross to Liberty	2,600		
8	Literary		868		
8	Newbnrgh	Broadway to paper mill	800		
8	Orange	Cross street easterly	80		
8	Pearl	Franklin to Monroe	2,830		
8	Wilson Ave.	Woodland avenue pipe south	60		To valve.
				7,188	
6	Bridge	Pearl street pipe to valve	47		
6	Case Avenue	Across Woodland avenue	100		
6	Carter	Girard street northerly	220		
6	Champlain	Seneca street westerly	354		
6	Cross	Broadway to Hill	440		
6	"	Orange street northérly	80		
6	Dodge	From X in Superior street	100		Northerly.
6	"	St. Clair pipe to Valve	30		
6	Forrest	Garden to Woodland	2,428		
6	Front	River to Spring	900		
6	Greenwood	Woodland pipe to Valve	60		
6	Garden	Perry to Cheshire	780		
6	Jackson	Woodland ave. pipe to valve	42		
6	Lorain	Pearl street pipe to valve	37		
6	Longwood	Woodland ave. pipe to valve	60		
6	"	Scovill " " "	24		
6	Mayflower	Woodland " " "	42		
6	"	Woodland avenue southerly.	480		
6	Monroe	Pearl street pipe to valve	47		
6	Park	Woodland ave. pipe to valve	60		
6	Perry	" " " "	42		
6	"	Broadway pipe to valve	57		
6	Sawtell	Woodland ave. pipe to valve	40		
6	Sterling	" " " "	60		
6	Woodland	Perry to Wilson avenue	6,736		
6	Ohio	Woodland avenue to valve	70		Easterly.
6	Cross	" " " "	42		Southerly.
				13,328	
4	Beech	Woodland ave pipe to valve	60		
4	Belmont	" " " "	42		
4	Brainard	Pearl street pipe to valve	37		
4	Bridge	" " " "	37		
4	Chatham	" " " "	47		
4	Charles	Woodland ave. pipe to valve	60		
4	Chapel	" " " "	60		
4	Cheshire	Garden street pipe to valve	35		
4	Champlain	For Fire hydrant	14		
4	Central Place	Bolivar street southerly	180		
4	Dodge	Superior st. pipe to old pipe	180		
4	Elm	Main to old river	1,080		
4	Granger	Garden street pipe to valve	35		
4	Huntington	Superior street southerly	1,180		
4	Henry	Woodland ave. pipe to valve	60		
4	Irving	" " " "	42		
4	Jay	Pearl street pipe to valve	47		
4	Lake		684		
4	Liberty	Broadway pipe to valve	30		
4	Laurel	Woodland ave. pipe to valve	60		
4	Linden	" " " "	60		
4	Maple	" " " "	60		
4	Osborn	" " " "	60		
4	Oak	Walnut street southerly	130		

SCHEDULE D.—CONTINUED.

DIAM. PIPE INCH'S	WHAT STREET	BETWEEN WHAT STREETS.	FEET PIPE LAID	TOTAL.	REMARKS.
4	Orchard	Lorain to Peach	720	....	
4	Penn...........	Lorain to Monroe	1,230	....	
4	Putnam	Woodland ave. pipe to valve	60	....	
4	Spring	Front street southerly....	46	....	
4	Walnut.........	Erie to Oak..........................	480	....	
4	Willey	Pearl street pipe to valve....	37	....	
4				6,853	
	Broadway	Pipe for fire hydrant...........	165	....	
3	Chatham.......	Cistern connection....... ..	5	....	
3	Forest..	Pipe for fire hydrants	65	....	
3	Lake...........	" " "	36	....	
3	Literary	" " "	18	....	
3	Newburgh.....	" " "	20	....	
3	Scovill	" " "	48	....	
3	Woodland....	" " "	238	....	
3	"	" " "	20	....	
3	"	Pipe for cistern....................	35	....	At Willcutt.
3	Garden.........	" "	30	....	At Harmon.
				680	

SCHEDULE D.—CONTINUED.

PIPES TAKEN UP AND RELAID.

SIZE OF PIPE TAKEN UP.	SIZE OF PIPE LAID IN PLACE.	STREET.	BETWEEN WHAT STREETS.	LENGTH.	Total.
6	6	Lorain......	Pearl street pipe to valve......	....	37
4	10	Broadway	Ohio to Cross.........................	1,100	
4	8	Broadway	Cross to Liberty......................	2,600	
4	6	Champl'n.	Seneca street westerly..........	354	
4	10	Erie...........	Superior to St. Clair...............	800	
4	4	Jay............	Pearl street pipe to valve......	47	
4	4	Lake	Wason street to Case avenue	684	
4	8	Pearl.........	Franklin to Monroe.............	2,830	
4	6	Woodland	Perry to Wilson avenue.......	6,736	
4	4	Willey	Pearl street pipe to valve......	37	
					15,188
3	3	Woodland	Fire hydrant pipe..................	....	210

PIPES LAID TO DECEMBER 31, 1869.

	24	20	16	12	10	8	6	4	3	2
Previous to 1869.....	2,668	10,913	12,458	...	15,507	17,151.5	43,537.75	98,506.25	6,721	817.5
Laid in 1869...........	....	....	36	35	5,918	7,188	13,328	6,853	680	....
Taken up in 1869...	....	....	....	...	....	....	37	15,188	210	....
	2,668	10,913	12,490	35	21,425	24,339.5	56,828.75	90,171		

26,071 feet. 200,808 feet

26,071 feet, or 4,937 miles of supply main, ar
200,808 " 38,032 " distributing pi

226,879 " 42,969 miles in all.

SCHEDULE E.

GIVING SIZE, NUMBER AND LOCATION OF STOP GATES IN THE STREETS IN 1869.

NO	SIZE IN INCHES.	LOCATION.	
		STREET.	SIDE OF STREET.
1	10	Broadway	South side of Ohio.
1	10	“	North “ Cross (south.)
1	10	Erie	“ “ Superior.
1	10	“	“ “ St. Clair (east).
1	10	Lorain	At Fulton.
1	10	“	West “ Fulton.
1	10	“	“ “ Orchard.
1	10	Scovill	East “ Burnham.
1	10	“	West “ Forest.
1	10	“	“ “ Case avenue.
1	10	Wilson avenue.	North “ Woodland avenue.
11	10	Gates	
1	8	Broadway	West “ Perry.
1	8	Franklin	East “ Pearl.
1	8	“	“ “ Pearl (on reducer.)
1	8	Literary	West “ Herschel.
1	8	Newburgh	South “ Broadway.
1	8	Orange	East “ Cross
1	8	Pittsburg ex	“ “ Liberty.
1	8	Pearl	South “ Franklin.
1	8	“	“ “ Bridge (east).
1	8	“	North “ Lorain.
1	8	“	South “ Monroe.
1	8	Wilson avenue.	“ “ Woodland avenue.
12	8	Gates	
1	6	Bridge	West “ Pearl.
1	6	Cross	South “ Broadway.
1	6	“	North “ Orange.
1	6	Case avenue	“ “ Woodland avenue.
1	6	“	South “ “
1	6	Dodge.	“ “ Superior.
1	6	“	North “ Superior.
1	6	“	South “ St. Clair.
1	6	Front	East “ River.
1	6	“	West “ Spring.
1	6	Forest	South “ Garden.
1	6	“	North “ Scovill.
1	6	“	South “ Scovill.
1	6	“	North “ Woodland avenue.
1	6	“	South “ “
1	6	Greenwood	North “ “
1	6	Jackson	South “ “
1	6	Longwood	North “ “
1	6	Lorain	East “ Pearl.
1	6	Monroe	West “ “
1	6	Mayflower	South “ Woodland avenue.
1	6	Perry	“ “ “
1	6	“	North “ Broadway.
1	6	Sawtell avenue	South “ Woodland avenue.
1	6	Sterling “	North “ “
1	6	Woodland av	West “ Henry.
1	6	“	“ “ Belmont.
1	6	“	“ “ Longwood.
1	6	“	“ “ Forest.
1	6	“	“ “ Case avenue.
1	6	“	“ “ Wilson.
31	6	Gates.	
1	4	Belmont	South “ Woodland avenue.
1	4	Brainard	East “ Pearl.
1	4	Bridge	“ “ Pearl.
1	4	Chatham	West “ “
1	4	Chapel	North “ Woodland avenue
1	4	Charles	“ “ “

SCHEDULE E.—Continued.

NO.	SIZE IN INCHES.	LOCATION.	
		STREET.	SIDE OF STREEL.
1	4	Elm	West side of Main.
1	4	“	East “ Old River.
1	4	Henry	North “ Woodland avenue.
1	4	Irving	South “ “
1	4	Jay	West “ Pearl.
1	4	Liberty	North “ Broadway.
1	4	Maple	“ “ Woodland avenue.
1	4	Orchard	South “ Lorain.
1	4	“	North “ Peach.
1	4	Osborn	“ “ Woodland avenue.
1	4	Park	“ “ “
1	4	Penn	South “ Lorain.
1	4	“	North “ Monroe.
19	4	Gates.	
1	3	Harmon.	South “ Garden (cistern con.)
1	3	Penn	At Chatham “
1	3	Scovill	At Forest “
1	3	Willcutt	South “ Woodland “
21	3		Set for Fire Hydrants.
25	3	gates.	

RECAPITULATION.

11	10 inch	stop gates.	25	3 inch	stop gates.
12	8 “	“			
31	6 “	“			
19	4 “	“			
73 in all for street use.			25		98 total for all purposes.

TABLE SHOWING NUMBER OF STOP GATES SET IN THE STREETS TO DECEMBER 31, 1869.

WATER WAY IN INCHES.	24	20	16	10	8	6	4	3	2	TOTAL.
Previous to 1869	2	12	16	22	37	94	255	100	7	545
Set in 1859	......	......	......	11	12	31	19	25	......	......
Taken up in 1869	......	......	......	......	......	......	......	......	......	......
Total	2	12	16	33	49	125	274	125	7	643

SCHEDULE F.

GIVING NUMBER AND LOCATION OF FIRE HYDRANTS SET IN 1869.

NO.	STREET.	BETWEEN.	SIDE.
1	Champlain	Opposite Police Station	North.
1	Dodge	S. E. corner Superior	East.
1	Elm	S. W. corner Spruce	West
1	"	200 feet S. of Old River	South.
1	Forest	Corner of Garden	West.
1	"	Garden and Scovill	East.
1	"	Scovill and Woodland	West.
1	Huntington	380 feet south of Superior	East.
1	"	780 " "	East.
1	"	1180 " "	East.
1	Literary	S. W. corner of Herschel	South.
1	Lorain	S. E. corner of Burton	South.
1	"	" " Tracy	South.
1	Newburg road	400 feet south of Broadway	West.
1	Orchard	Opposite Apple	North.
1	Penn	N. W. corner Monroe	West.
1	Scoville	S. W. corner Harmon	South.
1	"	Near Putnam	North.
1	"	S. E. corner Longwood avenue	South.
1	Woodland	Opposite First avenue	South.
1	"	N. E. corner Longwood avenue	East.
21	New fire hydrants set in 1869.		
235	New fire hydrants set previous to 1869.		
256	Total number new in use.		

REPORT OF THE

SECRETARY OF WATER WORKS.

WATER WORKS OFFICE,
CLEVELAND, January 1, 1870.

To the Trustees of the Water Works:

GENTLEMEN: The following is an abstract of the cash account of the receipts and expenditures of the Water Works for the year 1869:

RECEIPTS.

For water, less amount refunded	$62,869 72
For interest on bonds and deposits	375 50
From city, to pay interest on water bonds	38,000 00
From city, to lay water pipe	18,507 53
From sale of water bonds by City Treasurer	70,381 25
From sale of water bonds by Trustees	13 500 00
From American Exchange, National bank deposit	3,500 00
Cash in the Treasury, January, 1869	14,260 22
	$216,484 22

EXPENDITURES.

For running expenses	$18,880 56
For repairs	3,299 13
For pipe extension	67,830 67
For interest on temporary loans	206 87
For amount forwarded to pay interest on water bonds	37,550 00
For amount forwarded as deposit in New York	450 00
For amount refunded Mygatt & Morley	336 26
For inlet extension	3,909 80
For lake shore shaft	6,656 45
For lake crib	15,493 05
January 1, 1870, cash in office and on deposit	9,118 04
January 1, 1870, cash in City Treasury	53,253 89
	$216,484 [illegible]

LEDGER BALANCES JANUARY 1st, 1870.

Cash	$62,371 43	
American Exchange, National Bank, New York	20,098 20	
Discount	8,688 75	
Construction	517,732 39	
Pipe extension	280,511 13	
Lake crib	15,493 05	
Lake shore shaft	6,656 45	
Inlet extension	4,839 47	
Bonds		625,000 00
Water rent		216,218 72
City of Cleveland		30,058 32
Coupons		20,883 40
Interest		24,280 43
	$916,390 87	$916,390 87

The accounts, construction and pipe extension, amounting to $798,243.52, show the cost of the Water Works to date, excepting the lake tunnel now in the process of construction.

The following table exhibits the aggregate yearly receipts for water rent, and the expenditures for running expenses and repairs, from the time of the introduction of lake water into the city until the present time; also the earnings after deducting such expenditures:

YEARS.	Receipts for water less amount refunded.	Running expenses.	Repairs.	Receipts less running expenses and repairs.
1856 to 1859 inclusive	$34,528 73	29,845 49	2,996 08	1,687 16
1860	16,793 60	7,683 80	1,734 38	7,375 42
1861	17,097 85	7,768 36	1,350 84	7,978 65
1862	22,730 53	8,086 19	1,291 29	13,353 05
1863	23,421 30	10,011 96	835 54	12,573 80
1864	33,389 49	13,573 26	1,953 49	17,862 74
1865	40,888 01	17,346 56	1,382 21	22,159 24
1866	45,363 70	14,277 13	8,818 77	22,267 80
1867	51,862 45	14,246 06	3,685 79	33,930 60
1868	57,297 98	17,304 32	3,653 43	36,340 23
1869	62,869 72	18,880 13	3,299 56	40,690 03

It will be seen, by reference to the above, that the receipts for water for the year 1869 are in excess of the year 1868, the sum of $5,571 74, being about the annual increase for several years past. The increase since December, 1864, has been without any increase in the tariff of rates.

BONDS.

The proceeds of the sale of Water Bonds, by the City Treasurer, mentioned in the statement of cash accounts, are for the sale of bonds issued in 1869, at the instance of the City

Council, for the purpose of paying the cost of laying distributing pipes in certain streets.

The sale of bonds, by the Trustees, was ot a part of the $50,000 issued in 1859, the same having been in the possession of this department since their issue. No part of the $300,000 of water bonds, the issue of which was authorized by the City Council September 15th, 1869, has been sold.

The funded debt of the city for Water Works' purposes is as follows:

Seven per cent. bonds, due January 1, 1879	$400,000 00
" " " " " 1881	100,000 00
" " " " October 1, 1880	75,000 00
Six " " " July 1, 1878	25,000 00
" " " " " 1879	25,000 00
Total	$625,000 00

The funds in the hands of the Sinking Fund Commissioners are pledged for the payment of the principal of the Water Works' bonds, which fund will, without doubt, be sufficient to pay the same at the time of their maturity.

There is no other indebtedness of the Water Works.

Respectfully submitted,

H. C. HAWKINS,
Secretary.

REPORT OF SINKING FUND COMMISSIONERS.

To the Honorable City Council of the City of Cleveland:

The Board of Sinking Fund Commissioners, in compliance with law, herewith submit their Eighth Annual Report:

The gross income for the year is - - - -	$53,812	53
The expenses, (in part for 1868,) - - - -	1,020	00
Leaving the nett income, - - - -	$52,792	53

This, however, includes but one dividend on the Lake Shore Railroad Stock, as the dividend day has been changed to February 1st.

The following statement from the books of the Board, shows the receipts and expenditures for the year:

RECEIPTS.

1869.	Cash on hand January 5th, 1869 .... $	218	09
Jan. 12.	Overcharge on bond purchased, refunded	1	41
Feb. 1.	6 mo. int. on $30,000 Cleveland City 6 ⅌ cent. bonds....	900	00
Mar. 15.	6 mo. int. on $30,000 C. & M. R. R. Co. 7 ⅌ cent. bonds, less U. S. tax	997	50
April 1.	6 mo. int. on $82,500 C. P. & A. R. R. Co. 7 ⅌ cent. bonds, less U. S. tax	2,743	12
" 24.	6 mo. int. on $25,575 Cleveland City Note at 8 ⅌ cent..	1,023	00
" 30.	6 mo. int. on $51,500 U. S. 5-20 bonds	1,545	00
"	Premium on coupons at 34 ⅌ cent	525	30
June 1.	6 mo. int. on $25,000 Cin. & Ind. R. R. Co. bonds, less U. S. tax	831	25
" 1.	6 mo. int. on $5,000 Cleveland City 6 ⅌ cent. bonds.....	150	00
July 2.	6 mo. int. on $1,000 Cleveland & Pitt. R. R. Co. 6 ⅌ cent bonds, less U. S. tax	28	50
"	6 mo. int. on $60,000 Jamestown & F. R. R. Co. bonds at 7 ⅌ cent. less U. S. tax	1,995	00
"	6 mo. int. on $15,000 Cleveland City Note at 8 ⅌ cent...	600	00
"	6 mo. int. on $37,500 C. P. & A. R. R. Co. 7 ⅌ cent. bonds, less U. S. tax	1,246	88
Aug. 1.	6 mo. int. on $30,000 Cleveland City 6 ⅌ cent. bonds....	900	00
"	6 mo. dividend on $525,000 Lake Shore R. R. Co. Stock at 4 ⅌ cent	21,000	00
" 11.	6 mo. int. on $90,500 U. S. 5-20 bonds	2,715	00
"	Premium on coupons at 35 ⅌ cent	950	25

Sept. 15.	6 mo. int. on $30,000 C. & M. R. R. Co. 7 ℔ cent. bonds, less U. S. tax	997	50
Oct. 1.	6 mo. int. on $83,500 C. P. & A. R. R. Co. 7 ℔ cent. bonds, less U. S. tax	2,776	38
"	6 mo. int. on $52,500 Lake Shore R. R. Co. 7 ℔ cent. bonds, less U. S. tax	1,745	62
"	6 mo. int. on $38,000 Cleveland City 7 ℔ cent. bonds	1,330	00
" 18.	Sale of $73,000 U. S. 5-20 bonds at $1.18—$86,140. less U. S. tax $8.62, com. $45.63, express charges $73.00	86,012	75
" 19.	6 mo. int. on $25,575 Cleveland City Note at 8 ℔ cent	1,023	00
Nov. 1.	6 mo. int. on $51,500 U. S. 5.20 bonds	1,545	00
"	Premium on coupons at 28 ℔ cent	432	60
Dec. 1.	6 mo. int. on $25,000 Cin. & Ind. R. R 7 ℔ cent. bonds, less U. S. tax	831	25
"	6 mo. int. on $5,000 Cleveland City 6 ℔ cent. bonds	150	00
1870.			
Jan. 1.	6 mo. int. on $17,500 U. S. 5-20 bonds	525	00
"	Premium on coupons	105	00
"	6 mo. int. on $37,500 C. P. & A. R. R. 7 ℔ cent. bonds, less U. S. tax	1,246	88
"	6 mo. int. on $1,000 C. & P. R. R Co. 6 ℔ cent. bonds, less U S. tax	28	50
"	6 mo. int. on $60,000 Jamestown & F. R. R. Co. 7 ℔ ct. bonds, less U. S. tax	1,995	00
"	6 mo. int. on $15,000 Cleveland City Note at 8 ℔ cent	600	00
"	6 mo. int. on $11,000 Cleveland City 6 ℔ cent. bonds	330	00
	Total receipts	$140,044	78

DISBURSEMENTS.

1869.			
Feb. 8.	For $1,000 U. S. 5.20 bonds at 109½ ℔ cent	1,095	00
April 14.	" 1,000 C. P. & A. R. R. Co., 7 ℔ ct. bonds at 90 ℔ ct	900	00
May 4.	" Expense account	600	00
" 5.	" Expense account	20	00
July 6.	" $12,000 Cleveland City 7 ℔ cent. bonds	11,224	56
Aug. 5.	" 21,000 Cleveland City 7 ℔ cent. bonds	19,642	98
" 12.	" 5,000 Cleveland City 7 ℔ cent. bonds	4,676	90
Sept. 15.	" 2,000 Cleveland City 7 ℔ cent. bonds	1,830	07
Oct. 18.	" 100,000 Lake Shore and Michigan Southern Railway Company 7 ℔ cent. bonds at 85 ℔ cent	85,000	00
" 29.	" 10,000 Cleveland City 6 ℔ cent. bonds	9,150	00
Nov. 30	" 1,000 Cleveland City 6 ℔ cent. bonds	925	00
Dec. 31.	" 4,000 Cleveland City 6 ℔ cent. bonds	3,600	00
1870.			
Jan. 3.	" Expense account	400	00
	Cash balance on hand January 3d, 1870	980	27
	Total	$140,044	78

The following items constitute the Sinking Fund, January 3d, 1869 :

Bills receivable	$ 40,575	00
U. S. 5-20 bonds, par value	69,000	00
C. P. & A. R. R. Co. bonds, par value	121,000	00
Cleveland & Pittsburgh R. R. Co. bonds, par value	1,000	0
Jamestown & Franklin R. R. Co. bonds, par value	60,000	
Cleveland & Mahoning R. R. Co. bonds, par value	30,000	
Cin. & Ind. R. R. Co. bonds, par value	25,000	
Lake Shore R. R. Co. bonds, par value	52,50	
Lake Shore & S. Michigan R. R. Co. Sinking Fund bonds	100,0	

Cleveland City bonds	90,000 00
10,500 Shares of Stock, C. P. & A. R. R. Co. bonds	525,000 00
Clark & Williamson's indebtedness	31,045 41
Cash on hand	980 27
Total	$1,146,100 68

Respectfully submitted,

H. B. PAYNE, MOSES KELLY, W. BINGHAM, CHARLES HICKOX, F. T. BACKUS.	*Sinking Fund Commissioners.*

H. C. HAWKINS, *Secre'ary.*

CLEVELAND JANUARY 4TH, 1870.

FIFTEENTH ANNUAL REPORT

14

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TILDEN FOUNDATIONS.
1902

D

OF THE

Board of Trustees of Water Works,

TO THE

COUNCIL OF THE CITY OF CLEVELAND,

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD,

70
FOR THE YEAR 187[illegible]

CLEVELAND:
PRINTED AT THE LEADER BOOK AND JOB OFFICE, 142 SUPERIOR STREET.
1871. /5

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VI

FIFTEENTH ANNUAL REPORT

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FOR THE YEAR 187[illegible]

AMERICAN SOCIETY
1885
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NEW YORK.

CLEVELAND:
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TILDEN FOUNDATIONS.
1902

REPORT

OF THE

TRUSTEES OF THE WATER WORKS,

APRIL 1st, 1871.

WATER WORKS' OFFICE, April 1st, 1871.

To the Honorable City Council of the City of Cleveland:

GENTLEMEN: In presenting our Annual Report for the year 1870, the Trustees of Water Works call especial attention to the report of the Superintendent and Engineer, and Secretary, as presenting a full detailed statement of the operations for the year.

We have found it necessary to make this year some very unusual repairs, to parts of the works not built originally in a permanent manner. These repairs could not be longer delayed safely. We have now made them of a more durable character.

The large and expensive valves at the Engine House, have been for some years fractured and patched, and strapped, to
them in place. One of them we have replaced by a
valve, and the other will be the coming season.

It will be seen, that notwithstanding the extraordi
the net receipts for water rent are in excess of
upon the Water Work's debt outstanding, after
expenditures upon the new work not yet broug

The calls for pipe extensions are numerous and urgent. The net receipts are all applied to this purpose, together with such special sums as are from time to time provided by the Council.

Our city is rapidly growing and extending, and our Water Works are becoming more and more popular.

It appears to us highly important and proper that the benefits of these works should be made as general as possible consistent with due regard to economy.

The service rendered by the pumping engines during the entire year, has been highly satisfactory, but the consumption of water has increased so rapidly, and to such an extent, that it has become necessary to increase, without delay, our pumping capacity. Plans and estimates for this will soon be presented to your body for approval and sanction.

The aqueduct from the inlet pipe to the pumping engines, will soon be inadequate to the duty required of it. This will require the extension of the tunnel inland from the shore shaft to the Engine House, a half mile.

From present appearances, we judge that the fund ($300,000) already provided for tunnel and crib, will be sufficient to complete this extension of the tunnel.

The new work of seeking purer water is progressing satisfactorily, and we confidently hope to open the tunnel for use by January next.

All of which is respectfully submitted,

JOHN H. SARGEANT,
E. M. PECK,
WM. BINGHAM,
} TRUSTEES.

REPORT

OF THE

SECRETARY OF THE WATER WORKS.

WATER WORKS' OFFICE,
CLEVELAND, January 2, 1871.

To the Trustees of the Water Works:

GENTLEMEN: The following is an abstract of the cash account of the Receipts and Disbursements of this Department for the year 1870:

RECEIPTS.

For water	$70,411 18
For proceeds of date of Water Bonds	94,240 11
For interest on deposits	1,370 21
From city, to lay water pipe	3,064 31
Cash on hand, Jan. 1, 1870	62,371 48
Total	$231,457 24

DISBURSEMENTS.

For running expenses	$19,725 24	For lake tunnel	41,017 [illegible]
For repairs	9,823 00	For lake shore shaft	1,0[illegible]
For pipe extension	77,176 34	Cash in office & deposit, Jan. 2, '71	8,0[illegible]
For construction	188 40	Cash in City Treasury	16,[illegible]
For inlet extension	1,408 38		
For lake crib	49,786 93	Total	$231[illegible]
For lake shaft	6,612 42		

LEDGER BALANCES, DECEMBER 31, 1870.

	DR.	CR.
Water rent		$257,880 67
Bonds		727,000 00
City of Cleveland		33,122 63
Interest		26,385 84
Construction	$517,920 79	
Pipe extension	357,687 47	
Lake crib	65,279 98	
Lake tunnel	41,017 34	
Lake shore shaft	7,678 06	
Lake shaft	6,612 42	
Inlet extension	6,247 85	
Discount	16,448 64	
Cash	24,696 59	
	$1,043,589 14	$1,043,589 14

The accounts, construction and pipe extension, amounting to $875,608.26, show the cost of the water works to date, excepting the lake tunnel now being constructed.

The accounts, lake crib, lake tunnel, lake shore shaft, lake shaft and inlet extension, show the amount, $126,835.65, paid to date upon the lake tunnel work.

The following table exhibits the aggregate yearly receipts for water, and the expenditures for running expenses and repairs from the time of the introduction of lake water into the city until the present time; also the earnings after deducting such expenditures:

YEARS.	Receipts for water.	Running Expenses.	Repairs.	Receipts, less running expenses and repairs.
1856 to 1859 inclusive	34,528 73	29,845 49	2,996 08	1,687 16
1860	16,793 60	7,683 80	1,734 38	7,375 42
1861	17,097 85	7,768 36	1,350 84	7,978 65
1862	22,730 53	8,086 19	1,291 29	13,353 06
1863	23,421 30	10,011 96	835 54	12,573 80
1864	33,389 49	13,573 26	1,953 49	17,862 74
1865	40,888 01	17,346 56	1,382 21	22,159 24
1866	45,363 70	14,277 13	8,818 77	22,267 80
1867	51,862 45	14,246 06	3,685 79	33,93[illegible] 60
1868	57,297 98	17,304 32	3,653 45	36,340 23
1869	62,869 72	18,880 13	3,299 56	40,690 03
1870	70,411 18	19,725 24	9,823 99	40,861 95

It will be seen, by reference to the above table, that the receipts for water for the year 1870, are in excess of the year 1869, the sum of $7,541.46 being in excess of the annual increase for several years past. The large increase in the cost of repairs is principally owing to the substitution of iron stairs at the reservoir, in the place of the old wood ones, and at the engine house by the renewal of parts of the pumps and their connections.

BONDS.

The proceeds of the sale of Water Bonds, mentioned in the statement of cash account, are for the sale of part of the $300,000 of bonds, the issue of which was authorized by the City Council, September 15th, 1869, and of which there has been sold the amount of $102,000.

The funded debt of the city, for Water Works' purposes, is as follows:

Seven	per cent.	bonds,	due	January 1,	1879	$400,000
"	"	"	"	" "	1881	100,000
"	"	"	"	October 1,	1880	75,000
"	"	"	"	January 1,	1884	102,000
Six	"	"	"	July 1,	1878	25,000
"	"	"	"	"	1879	25,000
Total						$727,000

The Sinking Fund, under the control of the Sinking Fund Commissioners, is pledged for the payment of the Water Works' Bonds. It is believed that sufficient will be realized from that fund to pay the bonds at the time of their maturity.

The other indebtedness of this department does not exceed the cash on hand.

The interest on the Water Bonds is paid by the city, from a tax levied for that purpose, upon all the taxable property in the city.

Respectfully submitted,

H. C. HAWKINS,

Secretary.

FIFTEENTH ANNUAL REPORT

OF THE

SUPERINTENDENT AND ENGINEER

OF THE

CLEVELAND WATER WORKS.

To the Board of Trustees of Water Works:

GENTLEMEN: In conformity with the requirements of the law relating to Water Works, I herewith submit, for your inspection, the Fifteenth Annual Report of the condition of the works under my charge, together with a statement of the expenditures for the year.

The most important improvement that has been undertaken in connection with the Cleveland Water Works, since their completion, is the extension of a tunnel under Lake Erie, to a distance of one and a fourth miles from shore, for the purpose of securing at all seasons a supply of pure water.

In order to demonstrate in a practical manner the feasibility of the undertaking before contracting for the work, permission was asked and obtained of the City Council by the Water Works Board, to sink the shore shaft and build a portion of the tunnel, under their own immediate supervision. Under this authority, an agreement was made with Albert G. Smith, after he had completed the sinking of the shaft, as mentioned in my last Annual Report, to proceed with the work upon the tunnel until such time as the work could be let by contract. On the 8th of February the tunnel had been completed to a distance of about one hundred and sixty feet from the shaft, and the material through which the work had been built, was found to be very uniform in its character and of the most desirable quality for the safety of the work, and being at all times open for inspection to parties intending to hand in proposals for the completion of the tunnel, tended in no small degree to inspire them with confidence in the safety and final success of the undertaking. On that day the following propositions for the work were received:

NAMES.	Tunnel proper, including tunnel beyond Lake Shaft.	Crib, Lake Shaft and chamber beyond Lake Shaft.	TOTAL.	For each foot above height shown on plans to which crib may be built.	For each foot below depth shown on plans to which shaft may be built.	For each foot of tunnel beyond length specified.
A. A. McDonell	$116,820	$106,300	$223,120	$1,000	$1,000	$18.00
S. R. Beckwith & Co	128,000	110,000	238,000	1,200	43	19.25
S. M. Carpenter and A. J. Smith	104,517	67,835	172,352	800	33	18.00
George P. and George M. Smith	176,500	105,000	281,500	203	30	25.00
Ethan Rogers and C. V. Hough	155,000	92,000	247,000	741	200	18.00
A. H. and S. D. Delamater	165,200	64,700	229,900	750	50	25.00
E. Sims and C. H. Strong	142,450	105,767	248,217	1,200	150	25.00

The proposition of S. M. Carpenter and A. G. Smith being the lowest, the work was awarded to them, but after waiting a reasonable time, they declared their inability to procure acceptable sureties, but offered property security of their own, but such surety not being in accordance with law, was rejecte
proposals were again called for, when on the 8th day
the following propositions were received, the righ
served to separate the work by giving the tunn
different parties:

NAMES.	Tunnel proper, including 50 feet beyond lake shaft.	Crib, lake shaft and chamber beyond lake shaft.	TOTAL.	For each foot above height shown on plans to which crib may be built.	For each foot below depth shown on plans to which shaft may be built.	For each foot of tunnel beyond length specified.
A. A. McDonell	$112,600	$ 86,350	$198,950	$1,100	$ 300	$18.00
S. R. Beckwith & Co	159,000	56,000	215,000	900	50	20.00
S. R. Carpenter and A. G. Smith	130,800	65,758	196,558	1,000	40	20.00
Elias Sims & Co		63,835				
Fthan Rogers and C. V. Hough	142,000	95,000	237,000	741	200	18.00
D. D. and A. H. D. Delamater	159,940	53,904	213,844	950	60	24.00
Elias Sims	156,200	74,000	230,200	1,100	80	24.00

The proposal of A. A. McDonell, being the lowest for the tunnel and lake shaft, that portion of the work was awarded to him, and a contract, with satisfactory sureties, was entered into at once.

The progress of the work thus far has been such as to encourage the hope that it will be fully completed by the time allowed in the contract, viz: January 1st, 1872. On the 31st day of December, 1870, the tunnel had been completed to a distance of two thousand seven hundred and ten feet from the shaft. The rate of progress steadily increased from an average of about eight feet per day at the beginning of the work, to about fifteen feet per day at the close of the year. This large increase is not due to any change in the nature of the material through which the work is being driven, for that remains about the same as at the beginning, but is due to the fact that the workmen are constantly becoming more accustomed to the work.

The contract for constructing the crib and placing the same in position in the lake, was awarded to Messrs. E. D. and A. H. Delamater. The timber for that structure having been furnished the previous fall, work was commenced upon it early in the season, and on the 5th of August was completed to the full height specified in the contract, viz: forty-four feet, when it was successfully launched. The original design was to build it eight feet above the ordinary water line, but before launching it was determined to add three feet to its height, so that it would stand eight feet above extreme high water. On the morning of the 17th of the same month, the huge structure was towed out to its final resting place in the lake, by three powerful tugs, and made fast to five large anchors previously placed in position. At the time it left its moorings in the river bed, the lake was very still, but before it was made fast to the anchors, the wind, which had been light from the south-west all the morning, began to blow stronger, and before all the anchor cables had been made fast, the lake was quite rough, the waves running from four to six feet high. The crib was then about twenty feet south-east of the position in which it was designed to place it, and all the power of the three tugs to draw it against the wind was unavailing. Fearing that the wind might continue to increase in force and drag the anchors, orders were given to open the gates placed in the side walls for admitting water into the crib to sink it, when it commenced to desend slowly in the water, reaching the bed of the lake in just one hour from the time the gates were opened, and resting upon the bottom in a position nearly level.

Before being towed out of the harbor, the crib was loaded down so as to draw eleven feet of water, taking between five hundred and six hundred tons of stone to sink it to that depth, the weight being designed to sink the structure to the bottom of the lake when water was admitted. Immediately after reaching the bottom, a signal was given to four vessels lying in the harbor filled with stone, to proceed at once to the crib and unload their cargos, and by ten o'clock in the evening four hundred tons was added to the weight already in, making a total of one thousand tons, besides the weight of the structure itself, which is between eight hundred and nine hundred tons.

On the night of the 19th, a very severe storm raged, continuing until about noon of the 20th, when it was discovered that the crib had been thrown out of level two feet and four inches, and had settled into the clay three and one-half feet, on the side exposed to the storm, and fourteen inches on the [illegible] side.

Four feet, in addition to the three above [illegible] was added to the height of the crib by the 31st of [illegible] when a storm from the north-west came up and raged [illegible]olence for twenty-four hours, throwing the crib [illegible] level, and sinking it farther into the clay, its bottom now resting at an average depth of about eleven feet below the bed of the lake.

Preparations were immediately made to add twelve feet to its height, leaving it, when completed, that distance above high water mark. About four hundred cords of stone were thrown into the lake against the exposed sides, forming an embankment of stone about it, sixteen feet high, with a base of fifty feet; since then the storms have not moved it. It now stands eleven feet out of water, one foot of timber remaining to be added to complete its full height, which timber, together with all the materials for the building and light-house shaft to be placed on it, will be framed and ready to put in place by the opening of navigation.

The clay under the crib appears to be of the same quality as that in the tunnel, and the sinking of that structure to such a depth into it, can only be accounted for on the supposition that the weight of stone inside was not sufficient, not being more than half filled at the time it went down, to prevent a slight movement during storms, and that as it was lifted by each sea that struck it, water was admitted under it, which, when the seas receded and the crib fell back to its place, was driven out with great force, carrying with it the clay in a liquid state. Such action continuing for a length of time would naturally produce such an effect to a certain extent, even in harder material. Notwithstanding the heavy storms that followed each other in rapid succession immediately after the crib was placed in position, not a joint that had opened could be discovered, thus confirming the faith entertained of its power to resist the action of storms, to which it must ever hereafter be exposed. The preparation of the detail plans and the superintending of the construction of the crib, has been entrusted to the care of Mr. John Carnegie, to whose skill and good judgment the Board and contractors are alike greatly indebted for the satisfactory manner in which the work has been performed.

The expenditures to January 1st, 1871, upon the tunnel and crib, will be found in detail in the following pages.

The following is the report of the Chief Engineer of the pumping works:

WATER WORKS' ENGINE HOUSE,
Jan. 1st, 1871.

To the Board of Trustees of Water Works:

GENTLEMEN:—In accordance with the duty devolving upon me, I herewith submit a report upon the condition of the pumping machinery of the Water Works, with the amount of work done and the repairs and improvements made during the past year.

The West Engine was stopped on one occasion, on the 19th day of November, at 5.30 o'clock, a. m., by the breaking of the pumping main, about five hundred feet south of the engine house. At the time of this break the water in the reservoir was nearly up to its maximum level, which is twenty feet and three inches, the surface of the water at the time being about ten inches above the top of the inlet pipe, and when the break in the main happened, the water in the reservoir above the inlet flowed back to the break, washing away the embankment in which the main is laid, for a distance of nearly two hundred feet, thus by undermining the pipe, causing the greater part of the damage done, and leaving the city without water for two days. With this exception there has been an uninterrupted supply of water throughout the year, the average depth in the reservoir having been eighteen and seven-tenths feet.

The engines worked during the 362 days, the average running time per day being eighteen hours and fifty-five minutes, a per diem increase of three hours and twenty-three minutes.

Number of strokes made by east engine	1,877,875
Number of strokes made by west engine	1,630,625
Total number of strokes	3,5

Average height above surface of lake to which wa pumped, 156, 97-100 feet.

Duty of east engine	[illegible]
Duty of west engine	[illegible]

pounds of water raised one foot high with [illegible] pounds of coal consumed.

The following are the repairs and improvements made during the year :

Put a new lower valve and seat in the east main pump.

Put new rivets in man hole flange of No. 1, east boiler.

Removed and replaced braces over the furnace plates of numbers 2 and 3, east boilers, and No. 3, west boiler, for examination.

Repaired the cut-off valves and seats, and removed the valve stems of those valves of both engines.

Put new injection valves and seat in the east engine.

Removed the corroded and broken part of the smoke pipe, the remaining lower part good for further use is forty-two feet high above the stone base. A wrought iron flange was bolted to the top of the remaining part of the old pipe, and a new piece of pipe, twenty-five feet long, of 3-16 inch iron, and flanged at both ends, was erected on the old piece, and secured to it by bolts through the flanges, and stayed from the engine house roof with one 2½ inch gas pipe brace, and two braces of 1½ inch wire rope, thus leaving the pipe in good condition, and giving it a height of sixty-seven feet above the stone base, which height affords all the draft required.

The boilers and engines are in good working condition.

There has been no perceptible change in the condition of the fractured valve chambers since my last annual report.

The new valve chambers for the west main pump will be put in place as early as possible in the coming season.

I would respectfully call your attention to the following much needed improvements, viz:

1st. That the inlet pipe into the reservoir be raised one foot, by putting on it a piece of pipe to raise the inlet above the maximum water level.

2nd. To place a good automatic indicator in connection with the surface water in the reservoir in the engine room.

3d. To place a float in the pump, well or aqueduct, so as to indicate the height of water in the aqueduct at all times in the engine room.

4th. To have the oil cups of the (working beams,) main journals fitted with automatic oil feeders.

5th. A sheet iron apron across the boiler rooms over the fire doors, for better protection of the boiler house roof against fire.

I would also call your attention to the fact that the consumption of water during the dry times of the past summer and the cold weather of this winter, has been fully equal to the quantity that one engine can supply, working twenty three and three-quarter hours each day, and hereafer both engines will have to be worked apart of the time to keep up a supply of water.

The annexed schedule A, gives the record of the engines for the year 1870.

All of which is respectfully submitted.

JOHN VIAL,

Engineer in Charge.

It will be seen by the engine records for the year, that there has been a slight falling off in duty as compared with the two years preceding 1870, but the decrease is small and is probably owing to the use of a slightly inferior quality of coal.

The old unsightly wooden stairs at the reservoir have been removed, and new ones, with oak steps and hand-rail and iron carriages, trusses and risers, with stone foundations, have been erected in their place, and are neat and durable. The expense of erecting them, with the alteration to paving, was $1,676,00.

The reservoir will be cleaned out and the brick lining repaired early in the spring.

A new fence has been built along the Duane street front of the reservoir.

The grass, shrubbery, fencing and walks at the reservoir grounds are all in good condition.

The accompanying schedules give the informati
for a full knowledge of the distribution of wat
of pipes and their attachments for the year.

The number and size of new service pipe connections, made with mains, for the year, is as follows:

4 inch connections	1
3 inch connections	2
1 inch connections	3
¾ inch connections	16
⅝ inch connections	644
Total	666

The total number of service pipe connections, made with the mains, to January 1st, 1871, was 3,893. The number of each size being as follows:

4 inch connections	7
3 inch connections	10
2 inch connections	29
1½ inch connections	11
1 inch connections	85
¾ inch connections	223
⅝ inch connections	3528
Total	3893

The number of service pipes in actual use, is considerably less than is here shown, as many of them are laid only to the curbstone in streets that have recently been paved.

The expenses incurred in the different branches of the works, as shown by vouchers in this office, have been as follows:

EXPENDITURES.

RUNNING EXPENSES.

Pay Roll for twelve months	13,422 19
Coal	3,455 28
Ferrules and numbers	551 56
Hauling coal	399 39
Oil	347 50
Instruments	301 10
Printing and stationery	260 02
Furniture and fitting up office	256 48
Rent of store room	150 00
Plumbing	91 00
Mutton tallow	74 28
Cotton waste	73 92
Hemp packing	63 84
Manure for reservoir grounds	67 50
Telegraphing, postage and revenue stamps	46 74
Hardware	43 03
Soap	41 06
Hose	24 00
Livery and car fare	29 18
Freight	18 35
Red and white lead	11 83
Lumber and carpenter work	7 80
Blacksmithing	16 55

Farm work	5 50
Cement	4 30
Small stores	25 52
	19,785 92
Received for sundries	60 67
Net expenditures	$19,725 25

REPAIRS.

Pay Rolls for twelve months	$3,010 64
New stairs for reservoir	1,676 00
New stop valve and chamber for west pump	1,578 70
Blacksmithing	1,139 21
24 inch iron pipe	545 73
One centrifugal pump	562 00
Paving	333 55
Castings	236 13
Carpenter work and lumber	235 89
Team work	266 00
Cement, fire clay, brick and mason work	142 10
Enameled cloth and twine	92 44
Pig lead	48 75
Hardware	37 62
Rubber gaskets, for pumps	36 25
Plumbing	35 94
Repairing meters	33 86
White and red lead	30 37
Driving piles	17 20
Brass work	10 75
Freight	16 71
Printing	8 00
Telegrams	4 43
Small stores	4 26
	10,102 53
Received for sundries	278 54
	$9,823 99

PIPE EXTENSION.

Pay roll, for 12 months	$10,374 28
Cast iron pipe	52,659 18
Lead	3,487 66
Special castings	3,332 01
Valves	3,408 50
Hemp packing	288 80
Meters	536 50
Cartage	487 50
Blacksmithing	187 00
Plumbing	278 95
Paving	296 90
Coal	115 37
Wood plugs	85 35
Freight	66 03
Carpenter work and lumber	37 75
Mason work	16 00
Hardware	17 50
Printing	8 00
Hydrant	1 00
Fire clay	[illegible]
Rubber gaskets	[illegible]
Sundries	[illegible]
Received for sundries	[illegible]

CONSTRUCTION.

Hand rails, for openings at pump end of beams	$188 40

INLET EXTENSION.

Cast iron driving pipe	$ 137 50
Consulting engineer	1,125 00
Draughtsman	50 00
Printing and stationery	72 38
Instruments	13 50
Tug hire	10 00
	1,408 38
Expended previous to 1870	4,839 47
Total	$6,247 85

LAKE SHORE SHAFT.

Paid A. G. Smith for labor and materials	$ 711 71
Paid Cuyahoga Steam Furnace Co., for cast iron branch pipe	309 90
	1,021 61
Expended previous to 1870	4,656 45
Total	$7,678 06

TUNNEL.

Paid A. G. Smith, for labor and materials	$ 4,247 62
Paid A. McDonell, contractor, monthly estimates	35,330 21
Paid Inspector	734 75
Cement	272 25
Pay Roll—driving pipe	289 43
Hauling	29 75
Traveling	29 50
Printing and stationery	41 35
Pipe fitting and brass work	21 35
Timber and lumber	11 33
Blacksmithing	8 96
Hardware	84
	$41,017 34

LAKE CRIB.

Paid E. D. and A. H. Delamater, contractors	$48,667 12
Paid Geo. W. Calkins, for stone	4,885 00
Timber and lumber	4,310 54
Pay Roll—carpenters	2,536 86
Inspector and draughtsman	1,367 47
Tug and boat hire	860 50
Iron and Hardware	856 16
Dock rent	424 73
Watchman on crib	271 36
Repairing lighter	47 69
Delamater Bro's, for tools	50 80
Blacksmithing	44 38
Hauling	33 00
Lamps	30 45
Rope and blocks	18 10
Printing and stationery	38 80
Sundries	11 09
	64,454 05
Expended previous to 1870	15,493 05
	$79,947 10

The intimation in the report of the Chief Engineer of the pumping works, that the consumption of water is now about equal to the power of one pump to supply, shows the necessity for immediate action on your part, to provide for the erection of additional pumps. The ratio of increase in the consumption of water for the past year, was 25 28-100 per cent., being 8 36-100 per cent. greater than for the preceding year. This rapid increase will, in a few years, absorb all the power of both pumps, and in the meantime additional pumping power, equal at least to that of both the old pumps, should be provided, in order that we may at all times have a reserve of power, equal or nearly so, to the power in use.

The two pumps we have may be worked together, but in case of accident to one of them, the city must be placed under a short allowance of water during the time repairs are being made, necessarily causing great inconvenience and loss to the public.

The necessity of having all parts of the works in duplicate was never so forcibly realized as during the time the city was without water in November last, when the forcing main was broken. The City Council immediately authorized the laying of an additional pumping main from the engine house to the reservoir, but the work has been deferred, for the reason that an enlargement of the present or the erection of new pumping works was contemplated, and if the latter, the location could not at once be determined, and when a new main pipe is laid it should be done in connection with new pumping works. The cause of the break was, no doubt, the decaying of an old wooden drain, built at the time the main was first laid, for the purpose of carrying off the water from springs in the embankment. These springs were all taken up at the time the repairs were made, and the water carried off in cement and iron pipes, rendering accidents from similar causes impossible the future.

At this early day, it is impossible to make an accura mate of the amount of pipe to be laid during the comi but as an approximate, I would recommend the pur about three hundred tons of the different sizes, from four to twelve inches diameter, to be delivered as required.

Respectfully submitted,

JOHN WHITELAW,

Superintendent and Engineer.

March 1st, 1871.

SCHEDULE A.

ENGINE RECORDS FOR 1870.

EAST ENGINE.

Months.	*D's.*	*Pump'g*		*Strokes.*	*COAL CONSUMED.*			*Gallons water pumped.*	*Height*	*Duty.*
		hrs.	*m.*		*Ras'g steam*	*Pumping.*	*Total.*		*ft. | de*	
January ..	14	228	35	110,275	2,400	112,000	114,400	35,398,275	157,142	40,669,760
February..	21	362	05	175,825	2,400	168,800	172,200	56,439,825	157,325	43,112,631
March	12	199	30	93,625	2,400	85,600	88,000	30,053,625	157,242	44,911,226
April......	9	148	20	68,900	......	61,400	61,400	22,116,900	156,721	47,246,719
May	25	492	20	234,625	2,400	207,000	209,400	75,314,625	156,483	47,058,806
June......	17	330	40	164,100	......	168,800	168,800	52,676,100	156,524	40,857,673
July	23	446	05	239,950	2,400	227,200	229,600	77,023,950	156,448	43,891,127
August....	18	370	20	206,200	2,400	189,800	192,200	66,190,200	156,731	45,125,984
September	11	215	05	118,700	2,400	111,400	113,800	38,102,700	156,780	43,891,127
October ...	19	362	40	202,675	2,400	186,800	189,200	65,058,675	157,033	45,152,829
November,	12	230	25	128,175	......	123,800	123,800	41,144,175	157,624	43,810,593
December..	14	272	10	134,825	6,400	142,800	149,200	43,278,825	157,725	38,253,735
T'ls & av's.	195	3658	15	1,877,875	25,600	1,786,400	1,812,000	602,797,875	156,982	43,676,370

WEST ENGINE.

January ..	17	259	00	128,325	......	138,400	138,400	41,192,325	157,166	39,112,766
February .	7	116	05	56,650	2,400	58,400	60,800	18,846,650	157,083	39,289,941
March	19	331	40	158,300	......	159,000	159,000	50,814,300	157,385	42,065,685
April	21	372	50	171,000	2,400	163,000	165,400	54,891,000	156,527	43,434,767
May	6	110	15	51,550	......	48,000	48,000	16,547,550	156,374	45,072,295
June......	13	294	05	154,500	2,800	156,000	158,800	49,594,500	156,544	40,884,518
July	8	150	40	80,025	2,400	79,000	81,400	25,688,025	156,354	41,260,344
August....	13	282	05	149,957	......	146,600	146,600	48,136,197	156,365	42,935,455
September	19	395	15	217,818	4,000	205,200	209,200	69,919,578	156,885	43,850,860
October ...	12	240	55	131,875	2,400	123,800	126,200	42,331,875	157,208	44,100,516
November.	15	297	20	156,300	4,600	150,400	155,000	50,172,300	157,719	42,693,852
December.	17	343	55	174,325	2,400	174,000	176,400	55,958,325	157,887	41,885,826
T'ls & av's	167	3194	05	1,630,625	23,400	1,601,800	1,625,200	523,430,625	156,958	42,275,075

BOTH ENGINES.

T'ls & av's	**362**	**6852**	**20**	**3,508,500**	**49,000**	**3,388,200**	**3,437,200**	**1, 126,228,500**	156,970	43,010,620

SCHEDULE B.

AVERAGE ENGINE RECORDS FOR ALL YEARS SINCE COMPLETION OF WORKS.

EAST ENGINE.

Years.	Pumping		Strokes	COAL CONSUMED.			Gallons water pumped.	Height.	Duty.
	hrs.	m.		Raising steam.	Pumping.	Total.		ft. | dec.	
1857	693	35	231,354	118,850	235,225	354,075	73,626,095	158,000	29,604,192
1858	524	15	197,486	107,850	190,725	298,575	62,847,939	156,533	31,202,484
1859	668	15	300,064	111,750	262,050	373,800	95,420,352	155,896	35,329,535
1860	999	20	453,318	142,600	377,050	519,650	144,154,124	156,499	36,276,689
1861	1,066	45	509,785	131,550	415,900	547,450	162,111,630	156,424	38,690,736
1862	1,224	15	603,407	142,206	572 693	714,899	191,883,426	156,410	35,102,083
1863	1,187	35	605,475	132,788	559,500	692,288	194,357,475	156,693	36,788,845
1864	1,269	50	681,800	126,456	643,068	769,524	218,857,800	157,348	37,424,474
1865	1.507	00	835,525	147,600	799,400	947,000	268.203,525	158,084	37,441,369
1866	1,650	05	902,175	…………	…………	1,071,600	289,598,175	157,634	35,625,991
1867	1,541	05	835,875	110,500	843,900	954,400	268,315,875	157,478	37,022,693
1868	2,444	28	1,293,625	98,900	1,100,100	1,199,000	408,833,625	157,866	45,021,292
1869	2,689	25	1,311,025	36,400	1,178,000	1,214,400	420,839,025	157,495	45,641,403
1870	3,658	15	1,877,875	25 600	1,786,400	1.812,000	602,797,875	156,982	43,676,370

WEST ENGINE.

1857	512	50	168,540	107,350	172,100	279,450	53,636,170	158,000	28,321,942
1858	630	40	249,238	124,200	239,500	363,700	79,307,495	156,533	31,704,166
1859	744	45	323,691	121,300	287,550	408,850	102,813,738	155,958	36,065,129
1860	811	45	364,985	116,150	330,900	447,050	116,066,230	156,434	34,137,118
1861	1,040	50	503,344	133,050	438,250	571,300	160,063,392	156,440	36,405,441
1862	1,122	50	559,087	134,640	542,434	677,074	177,789,666	156,304	34,317,546
1863	1,402	55	705,400	149,115	709,918	859,033	226,433,400	156,694	34,541,163
1864	1,578	20	801,425	148,288	802,500	950,788	257,256,425	157,278	35,588,054
1865	1,461	40	775,880	139,350	780,150	919,500	249,057,480	157,950	35,778,436
1866	1,671	30	927,645	148,500	982,100	1,130,600	297,774,045	157,829	34,763,110
1867	2,329	05	1,333,500	159,700	1,318,500	1,478,200	428,053,500	157,400	38,026,854
1868	2,058	45.	1,121,350	99,200	978,500	1,077,700	359,953,350	157,778	44,072,868
1869	2,983	35	1,489,400	33,600	1,407,000	1,440,600	478,097,400	157,523	43,699,993
1870	3,194	05	1,630,625	23,400	1,601,800	1,625,200	523,430,625	156,958	42,275,075

TOTALS AND AVERAGES OF BOTH ENGINES TOGETHER, FOR EACH YEAR.

Years.	Pumping		Strokes.	COAL CONSUMED.			Gallons of water pumped.	Height.	Duty.
	hrs.	m.		Raising steam.	Pumping	Total.		ft. | dec.	
1857	1,206	25	399,894	226,200	407,325	633,525	127,262,265	158,000	
1858	1,154	55	446,724	232,050	430,225	662,275	142,155,434	156,533	31,453,325
1859	1,413	00	623,755	233,050	549,600	782,650	198,234,090	155,927	35,697,332
1860	1,811	05	818,303	298,750	707,950	766,700	260,220,354	156,466	35,206,903
1861	2,107	35	1,013,129	265,600	854,150	1,118,750	322,175,022	156,432	37,548,089
1862	2,347	05	1,162,494	276,846	1,115,127	1,391,978	369,673,092	156,357	34,720,024
1863	2,590	30	1,310,875	281,903	1,169,418	1,551,321	420,790,875	156,693	35,535,438
1864	2,848	10	1,483,225	274,744	1,445,568	1,720,392	476,114,225	157,313	36,410,146
1865	2,971	40	1,611,405	286,950	1,579,550	1,866,500	517,261,005	158,017	36,621,770
1866	3,321	35	1,829,820	276,800	1,925,400	2,202,200	587,372,220	157,731	35,304,587
1867	3,870	10	2,169,375	270,200	2,162,400	2,432,600	696,369,375	157,439	37,685,498
1868	4,503	13	2,394,975	198,100	2,078,600	2,276,700	768,786,975	157,822	44,364,421
1869	5,673	00	2,800,425	70,000	2,585,000	2,655,000	898,936,425	157,509	44,597,144
1870	6,852	20	3,508,500	49,000	3,388,200	3,437,200	1,126,228,500	156,970	43,010,620

SCHEDULE C.

SHOWING THE DISTRIBUTION OF WATER IN EACH MONTH IN 1870.

MONTH.	GALLONS DISTRIBUTED.			
	Per month.	Av. per day.	Ea. inh. per day.	Ea. con'r per day.
January	76,590,600	2,470,664	24,71	90,64
February	74,624,475	2,665,160	26,65	97,77
March	80,867,925	2,608,643	26,09	95,70
April	77,007,900	2,566,930	25,67	94,17
May	91,862,175	2,963,296	29,63	108,71
June	102,270,600	3,409,020	34,09	125,06
July	102,711,975	3,313,290	33,13	121,55
August	114,326,397	3,687,948	36,88	135,30
September	108,022,278	3,600,743	36,01	132,10
October	107,390,550	3,464,212	34,64	127,09
November	91,316,475	3,043,882	30,44	111,67
December	99,237,150	3,201,198	32,01	117,44
Total and average,	1,126,228,500	3,085,558	30,86	113,20

TOTALS AND AVERAGES FOR EACH YEAR SINCE COMPLETION OF WORKS.

YEARS.	GALLONS DISTRIBUTED.				PER CENT OF INCRE'SE
	Per year.	Average per day.	Ea. inh. per day.	Ea. con'r per day.	
1857	127,262,265	348,664	7,75	110,68	
1858	142,155,434	389.467	8,37	93,44	11,70
1859	198,234,090	513,107	11,31	91,27	39,45
1860	260,220,354	710,984	14,11	101,57	31,87
1861	322,175,022	881,599	16,32	114,50	23,81
1862	369,673,092	1,012,794	19,47	120,57	14,74
1863	420,790,875	1,152,857	20,97	117,54	12,83
1864	476,114,225	1,300,858	21,68	123,89	12,14
1865	517,261,005	1,417,153	21,80	122,70	8,64
1866	587,372,220	1,609,239	22,35	124,26	13,55
1867	696,369,375	1,907,861	23,85	115,98	18,55
1868	768,786,975	2,106,265	24,77	116,08	10,40
1869	898,936,425	2,462,839	27,36	120,20	16,92
1870	1,126,228,500	3,085,558	30,86	113,20	25,28

SCHEDULE D.

SHOWING EXTENSION OF WATER PIPE IN 1870.

DIAM. PIPE INCH'S	STREET.	BETWEEN WHAT STREETS.	FEET PIPE LAID	TOTAL.	REMARKS.
12	Ohio	Erie and Brownell	1,346		
12	Brownell	Ohio and Garden	100		
				1,446	
10	Superior	Perry and Case av	5,118		
10	Brownell	Ohio and Scovill av	581		
10	Prospect	Centre to E. S. Case av	48		Relaid.
10	Scovill av	Across Case av	56		
10	Lorain	Orchard to Courtland	2,606		
10	Scranton av	Girard and Fairfield	2,731		
10	Fairfield	Scranton and Merchants' av	1,496		
				12,636	
8	St. Clair	Erie to Wason	7,608		Relaid.
8	Broadway	Paper Mill to R. R.	945		
8	Literary	Professor and University	682		
8	Case av	Centre to S. line Prospect	30		Relaid.
8	Columbus	Franklin and Moore	322		“
8	Fairfield	Pelton av. and Merchant	505		
8	Professor	Pelton av. and Literary	310		
				10,402	
6	Wason	Superior and St. Clair	730		
6	Wason	Superior and St. Clair	250		Relaid
6	Wason	St. Clair and Lake	964		
6	Case av	Scovill and Woodland	1,192		
6	Cross	Broadway and Woodland	333		
6	Erie	Eagle and Parkman	1,034		
6	Cedar	Sterling av. and Greenwood	458		
6	Alabama	St. Clair and Lake	640		Relaid.
6	Canal	Ohio and Harrison	746		
6	Literary	Professor and Kellogg	1,020		
6	Jennings	Fairfield and Starkweather	1,797		
6	Jennings	“ north	645		
6	Franklin	Columbus west	93		
6	Hill	Cross north	72		
6	Clinton	Kentucky and Taylor	940		
6	Clinton	Centre to E. S. Kentucky	22		Relaid.
6	Oregon	Dodge and Muirson	1,535		
6	Wilson av	Across Euclid	100		
6	Euclid av	At Wilson av	16		
6	Parkman	Erie st. pipe E. to valve	42		
6	Webster	“ “ “ “	42		
6	Ohio	“ “ W “	57		
6	Forest	Woodland av. south	12		
6	Stone's Levee	North from 16 in Main	96		
6	Stone's Levee	West from Central Way	55		
6	Monroe	West from Pearl	12		
6	Muirson	St. Clair st. pipe south to valve	43		Relaid.
6	Ross	“ “ north “	56		
6	Buell	“ “ “ “	56		
6	Nevada	“ “ south “	43		
6	Alabama	“ “ “ “	43		Relaid.
6	Alabama	“ “ north “	56		“
6	Sterling av	“ “ south “	43		“
6	Phelps	“ “ “ “	43		“
6	Canal	Intersection of Ohio	32		“
6	Merchants' av	Fairfield st. pipe south	28		
6	Merchants' av	Fairfield st. pipe north	38		
				13,384	
4	Alabama	Lake st. to R. R.	615		Relaid.
4	Wason	Lake st. to R. R.	514		“
4	Oregon	Perry and Dodge	1,014		
4	Oak	Chestnut to pipe north	200		
4	Chestnut	Across Oak	75		
4	Chapel	Woodland av. and Oliver	360		
4	Harmon	Woodland av. north	12		
4	Bolivar	Erie st. pipe east to valve	42		
4	Summer	Erie st. pipe east to valve	42		
4	Canal	Huron st. south to pipe	430		
4	Hamilton	Brownell st. east	300		

SCHEDULE D.—CONTINUED.

DIAM. PIPE INCH'S	STREET	BETWEEN WHAT STREETS.	FEET PIPE LAID	TOTAL	REMARKS.
4	Rossiter........	St. Clair st. south to valve........	43	....	
4	Waring	" " " "	43	....	Relaid.
4	Beech	Woodland av. north	1,018	....	
4	Plum	Ohio st. pipe south to valve......	60	....	
4	Oregon..........	East from Erie st. pipe...........	12	....	
4	Muirson........	St. Clair st. pipe north to valve...	47	....	Relaid.
4	Minnesota......	" " south "	43	....	"
4	Delaware	" " " "	43	....	"
4	Sterling av......	" " north "	54	....	"
4	Lawrence	" " " "	54	....	"
4	"	" " south "	43	....	"
4	Aaron..........	" " " "	43	....	"
4	Lake..........	East from pipe in Wason.........	59	....	"
4	Erie............	To fire hyd. at Erie & Woodland..	29	....	
4	Oregon..........	" " north side......	30	....	
				5,225	
3	Miami Alley....	Huron st. pipe south.............	226	....	
3	Erie............	Lake and Summit alley...........	180	....	
3	Summit Alley..	Erie st. west.....................	342	....	
3	Hickox..........	Euclid and Prospect.............	516	....	
3		Connections to fire hyds.&Cist'rns	1,413	2,677	
				45,770	

SCHEDULE D.—CONTINUED.

PIPES TAKEN UP AND RELAID.

SIZE OF PIPE TAKEN UP.	SIZE OF PIPE LAID IN PLACE.	STREET.	BETWEEN WHAT STREETS.	LENGTH.	TOT'L
8	8	St. Clair....	Erie and Perry......	3,243	
8	8	Columbus..	Franklin and Moore..........	322	
					3,565
6	8	St. Clair....	Perry and Wason.......	4,305	
6	8	Case avenue	Across Prospect................	30	
					4,335
4	6	Wason......	St. Clair and Lake............	964	
4	6	Alabama...	" "	640	
4	6	Wason	" south	250	
4	6	Clinton	Across Kentucky..............	22	
4	6	Canal	" Ohio	32	
4	6	Muirson ...	" St. Clair south........	43	
4	6	Alabama...	" " south.........	43	
4	6	"	" " north........	56	
4	6	Sterling av.	" " north........	56	
4	6	Phelps	" " south........	43	
4	10	Prospect....	" Case avenue east........	48	
4	4	Wason	Lake street north............	514	
4	4	Alabama...	" "	615	
4	4	Rossiter....	Across St. Clair south........	43	
4	4	Waring	" " south........	43	
4	4	Muirson....	" " north........	47	
4	4	Minnesota..	" " south........	[illegible]	
4	4	Delaware...	" " south........	[illegible]	
4	4	Sterling av.	" " north........	[illegible]	
4	4	Lawrence...	" " north........	[illegible]	
4	4	"	" " south........	[illegible]	
4	4	Aaron	" " south........	[illegible]	
4	4	Lake.......	" Wason st. east	[illegible]	[illegible]
					[illegible]

TOTAL PIPES LAID TO DECEMBER 31, 1870.

DIAMETER IN INCHES.

Diameter in inches.	24	20	16	12	10	8	6	4	3	2
Previous to 1870....	2,668	10,913	12,490	35	21,425	24,339	56,829	90,171	7,191	817.5
Laid in 1870........	.....	......	......	1,446	12,686	10,402	13,384	5,225	2,677	...
....	2,668	10,913	12,490	1,481	34,061	34,741	70,213	95,896	9,868	817.5
Taken up in 1870..	.....	......	......	......	......	3,565	4,335	3,798	......	......
	2,668	10,913	12,490	1,481	34,061	31,176	65,878	91,598	9,868	817.5

26,071 feet. 234,880 feet.

26,071 feet, or 4,937 miles of supply main, and
234,880 “ 44,485 miles of distributing pipe.

260,951 “ 49,422 miles in all.

SCHEDULE E.

GIVING SIZE, NUMBER AND LOCATION OF STOP GATES SET IN 1870.

NO.	SIZE IN INCHES.	STREET.	LOCATION. SIDE OF STREET.
1	16	Erie..............	North side of Ohio.
1	16	Gates	
1	12	Ohio..............	West side of Brownell.
1	12	“	East side of Erie.
1	12	“	Between six inch and sixteen inch pipe.
3	12	Gates	
1	10	Prospect	East side of Case avenue.
1	10	Brownell..........	South side of Garden.
1	10	Superior	West “ Minnesota.
1	10	“	West “ Sterling avenue.
1	10	“	West “ Phelps.
1	10	“	West “ Case avenue.
1	10	“	East “ Williams.
1	10	Lorain	West “ Taylor.
1	10	“	West “ Liberty.
1	10	“	West “ Dare.
1	10	“	West “ Courtland.
1	10	Fairfield	West “ Jennings avenue.
1	10	“	East “ “ “
1	10	“	East “ Scranton avenue.
1	10	Scranton avenue.	Near Averill street.
15	10	Gates	
1	8	Case avenue......	South side of Prospect.
1	8	Broadway	Near paper mill lot.
1	8	“	North side R. R. Crossing.
1	8	Literary	East side of Professor.
1	8	Professor.........	North “ Literary.
1	8	Fairfield	East “ Merchant.
1	8	St. Clair..........	East “ Wason.
1	8	“	West “ Lawrence.
1	8	“	West “ Sterling avenue.
1	8	“	West “ Alabama.
1	8	“	West “ Buell.
11	8	Gates	

SCHEDULE E.—CONTINUED.

NO.	SIZE IN INCHES.	STREET.	LOCATION. SIDE OF STREET.
1	6	Canal	South side of Ohio.
1	6	Ohio	East “ Canal.
1	6	Hill	West “ Cross.
1	6	Case avenue.....	South “ Scovill.
1	6	Stone's Levee....	West “ Central Way.
1	6	Literary	East “ Merchant avenue.
1	6	Jennings	North “ Starkweather avenue.
1	6	“	North “ Kellogg avenue.
1	6	“	South “ Fairfield.
1	6	“	North “ “
1	6	Merchants.........	South “ “
1	6	“	North “ “
1	6	Stone's Levee....	North “ Ohio.
1	6	Webster	East “ Erie.
1	6	Ohio	West “ “
1	6	Parkman	East “ “
1	6	Erie	North “ Ohio.
1	6	“	South “ “
1	6	Clinton	West “ Kentucky.
1	6	“	East “ Taylor.
1	6	Wilson avenue...	South “ Euclid.
1	6	“ ...	North “ “
1	6	Cedar	West “ Hudson.
1	6	Oregon	East “ Muirson.
1	6	“	West “ Dodge.
1	6	Oregon	Half way between Muirson and Dodge.
1	6	Wason	North side of Superior.
1	6	Buell	North “ St. Clair.
1	6	Nevada...........	South “ “
1	6	Alabama	South “ “
1	6	“	North “ Lake.
1	6	Wason	South “ Hamilton.
1	6	“	South “ St. Clair.
1	6	Sterling avenue..	South “ “
34	6	Gates	
1	4	Oak...............	North “ Chestnut.
1	4	Oregon	East “ Erie.
1	4	“	East “ Dodge.
1	4	“	West “ Perry.
1	4	“	Between Perry and Dodge.
1	4	Columbus.........	South side of Centre.
1	4	Erie	Opposite Parkman.
1	4	Bolivar	East side Erie.
8	4	Gates	
1	3	Erie	North side of Lake.
1	3	Hickox	South “ Euclid.
1	3	Miami alley	South “ Huron.
3	3	Gates	Set for street pipes.
50	3	“	“ fire hydrants.
53	3	“	“ all purposes.

RECAPITULATION.

WATER WAY IN INCHES.	16	12	10	8	6	4	3	
Number	1	3	15	11	34	8	3	....
....	......	......	......	......	......	......	50	...
....	......	......	......	......	......	......	....	..

Total, 75 for street use; 50 for fire hydrants; 125 for all

TOTAL NUMBER OF STOP GATES IN STREETS, TO DECEMBER 31, 1870.

WATER WAY IN INCHES.	24	20	16	12	10	8	6	4	3	2	TOTAL.
Previous to 1870	2	12	16	....	33	49	125	274	125	7	643
Set in 1870	....	....	1	3	15	11	34	8	53	....	125
Total	2	12	17	3	48	60	159	282	178	7	768

SCHEDULE F.

GIVING NUMBER AND LOCATION OF FIRE HYDRANTS SET IN 1870.

No.	STREET.	BETWEEN.	SIDE OF STREET.
1	Case av	Woodland and Scovill	East
1	Beech	“ “ “	East
1	Scranton av	437 ft. south of Girard	West
1	“	893 ft. “ “	West
1	“	1,578 ft. “ “ (Lowry,)	East
1	“	1,946 ft. “ “ (“)	West
1	“	Opposite Fairfield	West
1	Stone's Levee	Near Ohio street,	East
1	Literary	South east corner University	East
1	“	South west corner Professor	West
1	“	175 ft. south of Pelton av	West
1	Fairfield	West line of “	North
1	“	West line Merchants' av	South
1	“	East line of Jennings av	North
1	Jennings av	438 ft. north of Kellogg av.	West
1	“	North line of “	West
1	“	South line of Sycamore	West
1	Lorain	98 ft. west of Orchard	North
1	“	West line of Harbor	North
1	“	100 ft. west of Taylor	South
1	“	West line of Liberty	North
1	“	50 ft. east of Dare	North
1	“	West line of Courtland	North
1	Clinton	Kentucky and Taylor	South
1	“	East line of Taylor	North
1	Broadway	170 ft. north of R. R. Crossing	West
1	“	Opposite Brick street	West
1	Oregon	South west corner of Perry	South
1	“	South east corner of Dodge.	South
1	“	Dodge and Perry	North
1	“	530 ft. west of Dodge	North
1	“	505 ft. east of Muirson	South
1	“	North east corner “	North
1	Wason	485 ft. north of Lake	East
1	Oak	North east corner of Chestnut	East
1	Erie	South east corner of Ohio	East
1	“	Opposite Parkman	West
1	Ohio	“ Allen	North
1	“	At Plum	South
1	Wason	390 ft. north of Superior	East
1	Superior	East line of Wason	South
1	“	West line of Phelps	North
1	“	Opposite Rossiter	South
1	“	East line of Delaware	North
1	“	130 ft. west of Alabama	South
1	“	East line of Nevada	North
1	“	490 ft. east of Perry	North
1	Cedar	East line of Greenwood	South
1	Canal	330 ft. south of Huron	West
1	Chapel	Opposite Oliver	East
1	Scoville	“ Burnham,	North
1	Case	South line of Scoville	West.

52	New Fire Hydrants set in 1870.
256	Fire Hydrants set previous to 1870.
308	Total number now in use.

mp

'D. [illegible] 1913